ENGINEERING NEWS-RECORD

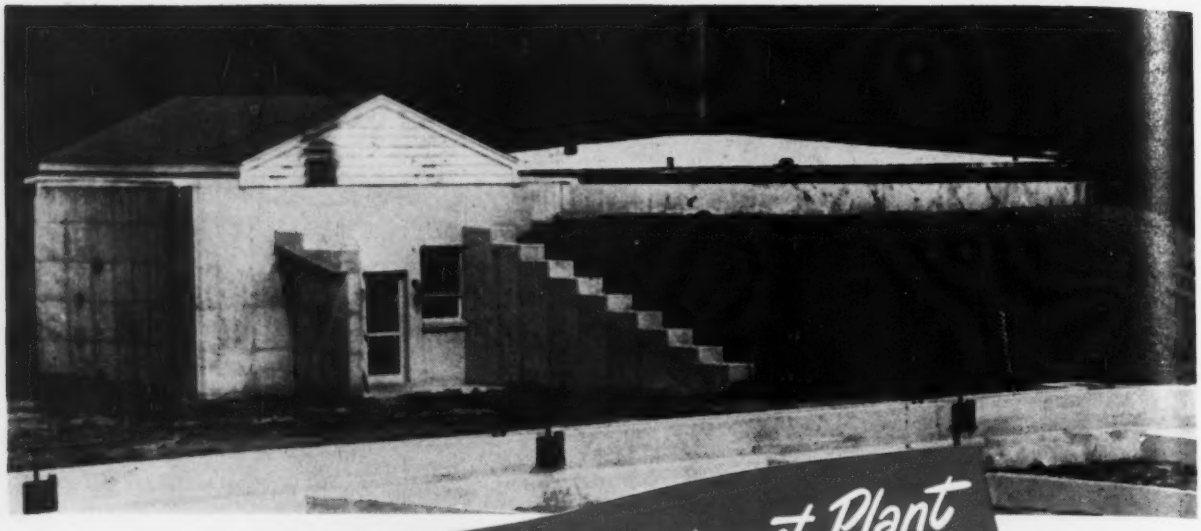
AUGUST 8, 1946

Spillway over the powerhouse features dam in France

ENGINEERING LIBRARY

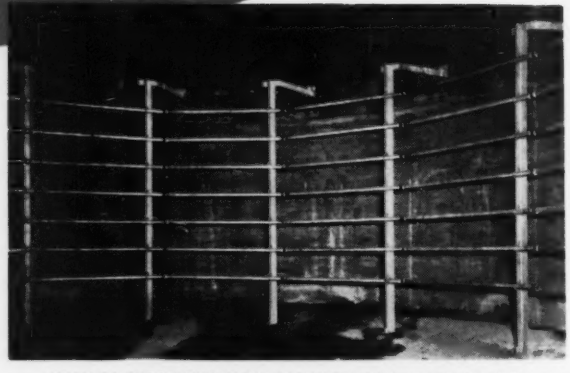
Featured In This Issue

Helping Cities To Help Themselves
France Rebuilds Its Bridges
Building Materials Research Laboratory



In this new Sewage Treatment Plant

BYERS WROUGHT IRON PIPE helps avoid maintenance



TYPICAL WROUGHT IRON DIGESTER COIL INSTALLATION

When Thomasville, Georgia, constructed a new sewage treatment plant, the sound policy of building for permanence was followed. Severe corrosion was rightly anticipated in water and gas lines, and digester coil piping. To forestall excessive repairs and maintenance, Weideman & Singleton, the engineers, specified a time-tried material . . . wrought iron. Byers Wrought Iron pipe was used.

Digester coils are perhaps the most corrosive service in a treatment plant, as the normally aggressive character of the sewage is increased by elevated temperatures. Gas lines, also, are ranked by authorities as among the most punishing applications. The fact that wrought iron has been used in so many of the largest, most modern plants built during the past decade is an excellent indication of the confidence that engineers feel in the material. This confidence has been earned by wrought iron's excellent service.

There is no mystery as to why wrought iron serves so well in these punishing services. Its unusual corrosion resistance comes directly from its unusual composition and structure. Tiny fibers of glass-like silicate slag, 200,000 or more to the square inch of section, are threaded through the main body of high-purity iron. These fibers halt and diffuse corrosive attack, and so discourage pitting. They also anchor the initial protective scale, which acts as a shield for the underlying metal.

If you are concerned with the construction of a new sewage treatment plant, or the maintenance of an old one, you will find some helpful information on how to reduce repairs and maintenance in our bulletin, "Wrought Iron for Sewage Treatment and Disposal Installations." May we send you a complimentary copy?

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FEATURES IN THIS ISSUE

News of the Week..... 69
Editorials..... 78
Seven-Mile El Mirador Tunnel in Mexico..... 80
Chemical Treatment in Los Angeles Sewers..... 83
Helping Cities to Help Themselves.....J. O. HECK 85
Break-Point Chlorination.....S. E. EDWARDS and C. B. McCALL 89
Laboratory Features Novel Movable Partitions..... 91
Army Engineers Transformed Manila Harbor.....H. LEOPOLD 94
France Advances Rail Bridge Restoration..... 100
French Engineers Build Dam.....V. T. BOUGHTON 104
Golden Gate Bridge Vibration Studies..... 106
Concrete Deck Built on Wood Piles..... 107

DEPARTMENTS

Construction Trends..... 63
Construction Scoreboard..... 65
New Construction Volume..... 67
From Field and Office..... 108
Comment and Discussion..... 110
Book Notes and Reviews..... 112
Material Prices..... 114
New Aids..... 122
Manufacturers Activities..... 136
Manufacturers Publications..... 137
Elections and Activities..... 140
Men and Jobs..... 144

Construction Reports..... 195

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The index for Volume 136 (January to June 1946) will be mailed without further request to all those who ordered an index for Volume 135. Subscribers who wish the index and who did not receive the Volume 135 index or who have since changed their address should return this coupon.

The Editor, Engineering News-Record
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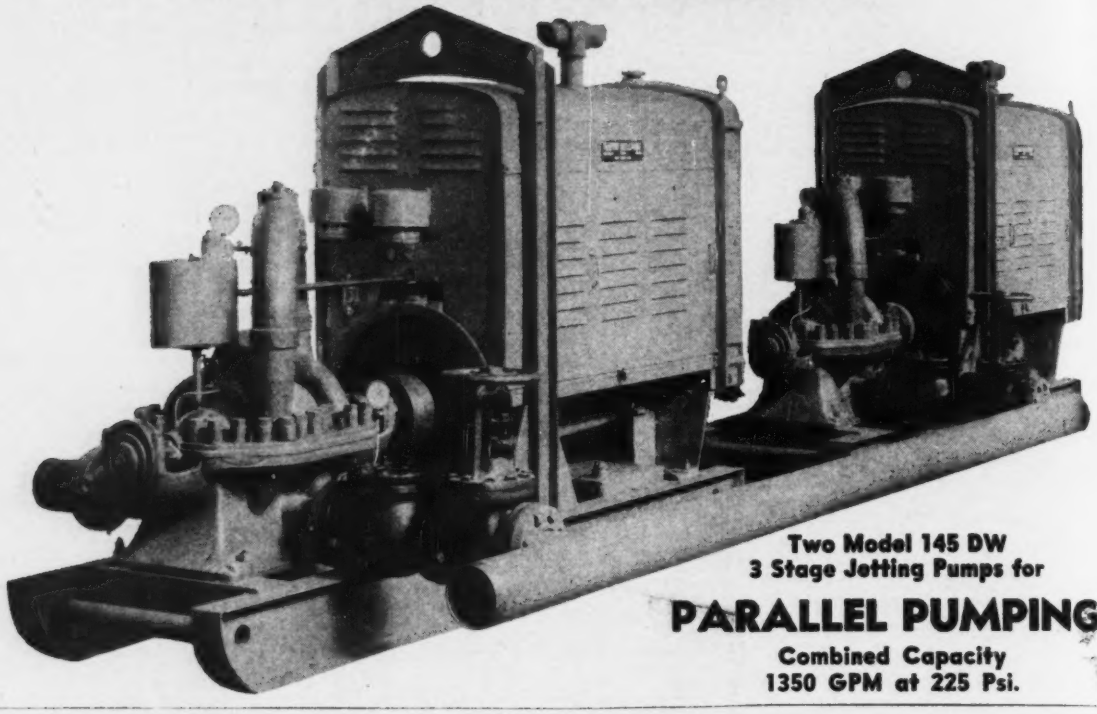

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PARALLEL PUMPING

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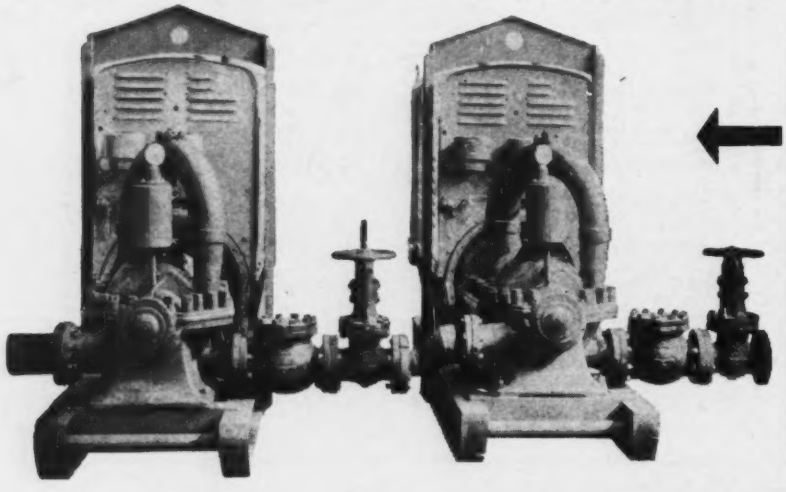

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Construction Trends

Contractor Cost Indexes Up Higher Than Wage and Price Trends

A spot check of construction costs as measured by construction and building cost indexes shows that contractor indexes increased sooner and are now going up faster than the weighted indexes.

For example, the contractor cost indexes regularly quoted by *Engineering News-Record* rose from 6.1 to 8.9 percent in the second half of 1945, then another 5.5 to 15.0 percent in the first half of 1946. In this same period, the weighted indexes regularly reported, moved up 0.7 to 5.4 percent in 1945 and 5.5 to 11.7 percent in 1946. The year's rise range for the contractor indexes is 11.6 to 20.4 percent compared with 9.6 to 17.9 for the weighted indexes. The average contractor cost index rise for the last half of 1945 was 7.8 percent compared with 2.8 percent for weighted indexes, while in the first half of 1946 the contractor average of 10.2 percent compared with 10.1 for weighted indexes.

Low labor productivity, materials shortages, overtime to make up for labor shortages, and work stoppages are reflected in contractor pricing, whereas the weighted indexes measure only hourly wage rate and material price trends.

The accompanying table compares these rises in cost indexes for the two six-months periods. The August values for *ENR* construction and building cost indexes will be found on page 67.

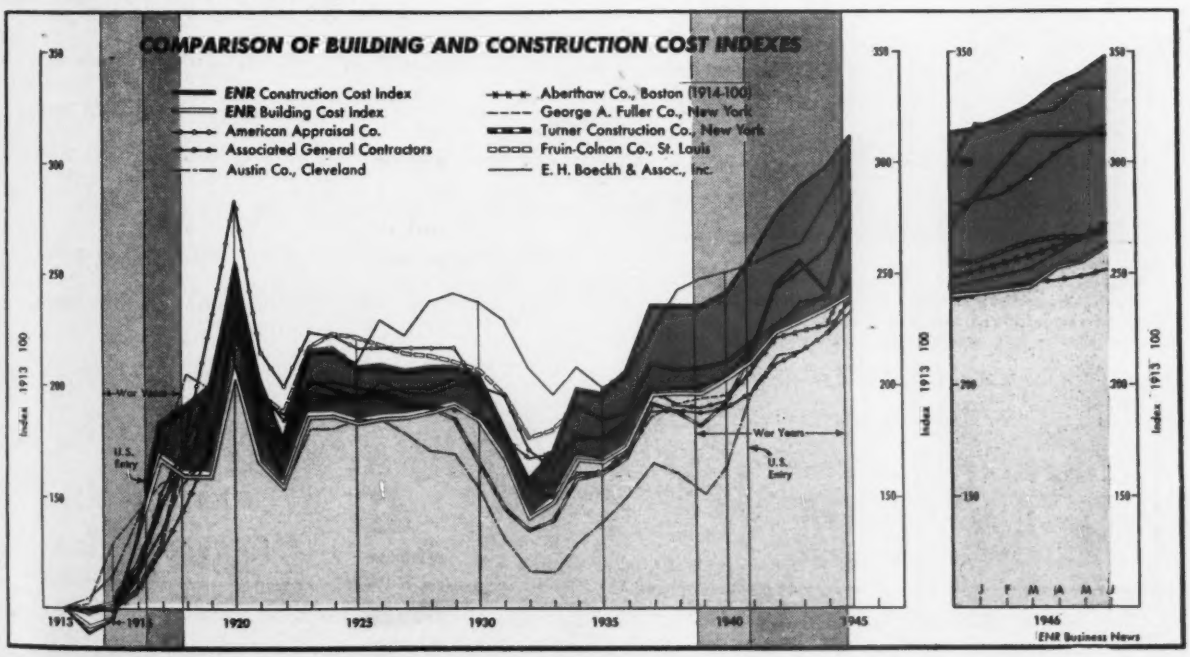
CONSTRUCTION COST INDEX VALUES COMPARED

Weighted Indexes	June 1945	Dec. 1945	% Gain 6 Months	June 1946	% Gain 6 Months	% Gain 12 Months
ENR Construction	309	313	1.6	348	11.0	12.6
ENR Building	239	241	0.7	264	9.7	10.5
American Appraisal	269	282	5.4	317	12.4	17.9
Associated General Contractors	229	238	4.1	251	5.5	9.6
E. H. Boeckh	293	299	2.3	334	11.7	14.0
Contractor Indexes						
Aberthaw[a]	232	248	7.5	270	8.9	16.4
George A. Fuller	240	261	8.75	[c]	[c]	[c]
Turner	263[b]	273	4.4[b]	314	15.0	19.4
Fruin-Colnan	242	256	6.1	270	5.5	11.6
Austin	226	244	8.9	272	11.5	20.4

[a] The Aberthaw index adopted a new method of computing in March 31, 1946. Formerly it represented the repricing, according to current experience, a 7-story and basement, reinforced concrete building built in 1914. The new index is computed by repricing a composite of 36 major cost items in five types of industrial buildings — 3 multi-story, 2 one-story, including all mechanical trades.

[b] This is cost index for September 1945. None computed in June.

[c] June 1946 index not available.



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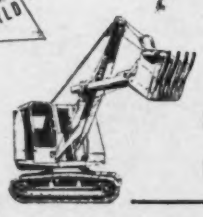

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New Construction Volume in July

Total July volume of $536,594,000 has gained 214 percent over last year. Private construction, although 32 percent below June is 468 percent greater than July, 1945

Civil engineering construction volume in continental United States totals $536,594,000 for July, an average of $134,148,000 for each of the four weeks of the month. This average is 3 percent below the average for June, and is 214 percent above the average of July, 1945 according to *Engineering News-Record.*

Private construction for July on a weekly average basis is 32 percent below last month, but 468 percent greater than July, 1945. Public construction is 45 percent above last month and 132 percent above last July. State and municipal construction, while 1 percent below last month, is 236 percent above the average for July, 1945. Federal construction, up 146 percent from last month, is up 82 percent from July, 1945.

Weekly averages in the various classes of construction for July, 1946 compared with June, show gains in highways of 27 percent; public buildings, 64 percent; waterworks, 103 percent; earthwork and drainage, 72 percent, and public unclassified, 151 percent; losses in industrial buildings, 36 percent; commercial buildings, mostly mass housing, 26 percent; public bridges, 10 percent; private bridges, 100 percent; sewerage, 37 percent; and private unclassified, 65 percent.

Geographically, only three sections show gains in July, 1946 over June—South, 10 percent; West of Mississippi, 24 percent; and Far West, 17 percent. New England dropped 43 percent below; Middle Atlantic, 37 percent; and Middle West, 75 percent.

Five sections made gains in July over July, 1945, New England, 59 percent; Middle Atlantic, 330 percent; South, 139 percent; West of Mississippi, 362 percent; and Far West, 176 percent. Middle West dropped 42 percent.

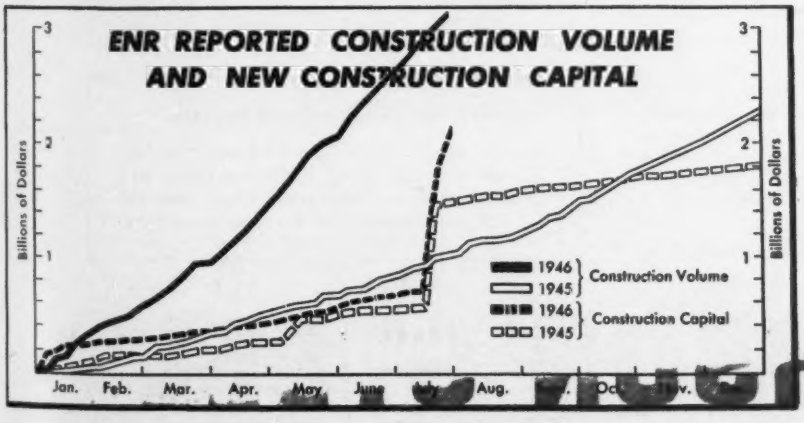
New capital for construction purposes for the four weeks of July, 1946 totals $1,511,931,000, or a weekly average of $377,983,000, 1,973 percent above the June average and 100 percent above the average for July, 1945.

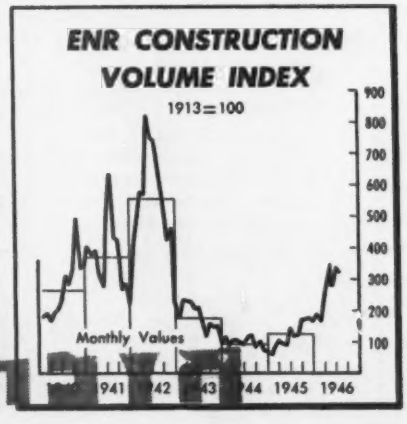
ENGINEERING CONSTRUCTION CONTRACTS REPORTED TO ENGINEERING NEWS-RECORD—JULY, 1946

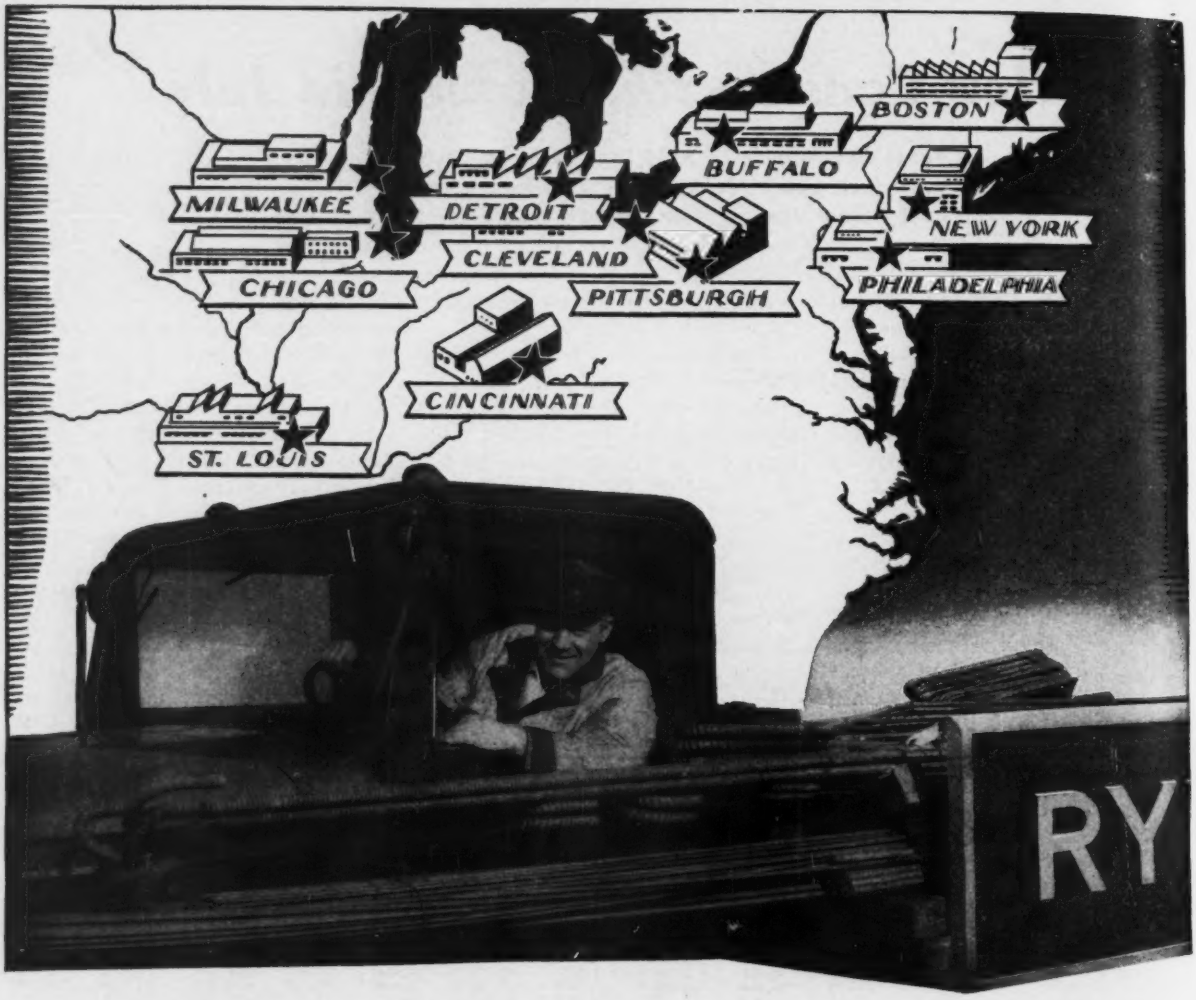
Engineering News-Record *reports continental U. S. Construction projects of the following minimum costs — waterworks, excavation, drainage and irrigation,* $22,500 ; *other public works,* $40,000; *industrial buildings,* $55,000; *other buildings,* $205,000

Four Weeks — Thousands of Dollars (000 Omitted)

	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	United States July 1946	United States Seven Months 1946	United States Seven Months 1945	Canada
Public Works										
Waterworks	1,109	810	2,045	927	1,917	3,243	10,051	56,200	25,112	399
Sewerage	369	4,071	839	3,214	1,554	1,910	11,957	57,837	16,896	378
Bridges, public	1,487	3,456	2,789	1,458	1,527	1,297	12,014	74,480	15,889	246
Earthwork and waterways	529	5,359	1,352	1,480	39,920	27,227	75,867	270,581	23,538	755
Streets and roads	3,548	16,411	24,876	12,649	21,344	11,997	90,825	449,661	121,639	5,569
Buildings, public	1,344	13,665	14,578	6,865	12,858	15,107	64,417	227,376	382,221	2,517
Unclassified, public	442	9,214	4,962	2,678	4,024	13,409	34,729	117,072	193,195	676
Total public	8,828	52,986	51,441	29,271	83,144	74,190	299,860	1,253,307	748,490	10,540
Federal government (included in above classifications)	903	25,353	18,857	6,001	53,682	55,017	159,813	473,513	574,872	.....
Private										
Bridges, private	.....	.....	.....	.....	.....	.....	.....	1,471	3,706	.....
Industrial buildings	3,382	5,328	19,126	15,312	12,606	14,136	69,980	596,895	202,208	5,754
Commercial buildings	2,738	49,363	8,387	11,915	43,139	41,636	157,178	1,199,919	58,841	9,065
Unclassified, private	326	170	114	890	7,035	1,041	9,576	117,188	33,894	1,434
Total private	6,446	54,861	27,627	28,117	62,870	56,813	236,734	1,915,473	298,649	16,253
Total Engineering Construction:										
July, 1946 — 4 weeks	15,274	107,847	79,068	57,388	146,014	131,003	536,594	.....	.....	26,793
June, 1946 — 4 weeks	26,749	172,141	71,725	55,601	117,545	111,708	555,469	.....	.....	23,701
July, 1945 — 4 weeks	9,594	25,077	33,090	24,052	31,627	47,544	170,984	.....	.....	22,934
Seven Months — 1946	175,322	708,295	419,499	366,728	689,766	818,170	.....	3,168,780	.....	192,332
Seven Months — 1945	47,512	145,462	184,913	162,192	229,768	277,292	.....	.....	1,047,139	79,138







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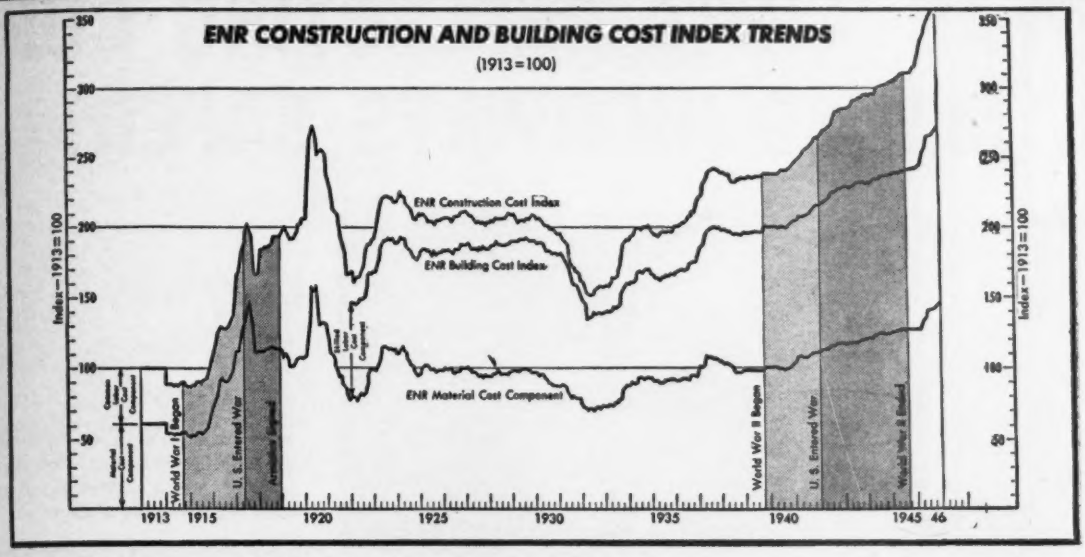
AUGUST CONSTRUCTION BUSINESS REPORT



ENR CONSTRUCTION VOLUME AND NEW PRODUCTIVE CAPITAL

Thousands of Dollars (,000 omitted)	July 1945 (4 wk.)	July 1946 (4 wk.)	% Change	Seven Months 1945 (30 wk.)	Seven Months 1946 (30 wk.)	% Change
Total U. S. Construction	$170,984	$536,594	+214	$1,047,139	$3,168,780	+203
Private Construction	41,794	236,734	+466	298,649	1,915,473	+541
Public Construction	129,190	299,860	+132	748,490	1,253,307	+67
Federal	87,566	159,813	+83	574,872	473,515	−18
E N R Construction Volume Index, 1913 = 100	119	327	+175	98	273	+179
Total New Productive Capital	945,949	1,511,931	+60	1,485,700	2,179,329	+47
Private Investment	50,634	245,199	+384	316,775	754,277	+138
Federal (non-federal work)	141,000	225,000	+60	163,600	225,000	+38
Federal (federal work)	754,315	1,041,732	+38	1,005,325	1,200,052	+19

CONSTRUCTION COST . . . . WAGE RATES . . . . MATERIAL PRICES

1913 = 100	August 1945	August 1946	% Change	Change July to August 1945: July	1945: August	1945: %	Change July to August 1946: July	1946: August	1946: %
E N R Constr. Cost Index†	309.08	361.37	+16.92	308.99	309.08	‡	353.89	361.37	+2.11
E N R Building Cost Index†	239.94	271.98	+13.35	239.64	239.94	+0.1	266.13	271.98	+2.20

† *Does not reflect increased costs due to overtime, lower labor efficiency, delivery delays, etc.*

ENR 20-CITIES' AVERAGE

Common Labor	$0.916	$1.071	+16.92	$0.916	$0.916	0	$1.058	$1.071	+1.23
Skilled Labor (Av. 3 Trades)	1.668	1.824	+9.35	1.665	1.668	+0.2	1.811	1.824	+0.72
Bricklayers	1.770	1.948	+10.06	1.770	1.770	0	1.928	1.948	+1.04
Structural Ironworkers	1.720	1.825	+6.10	1.716	1.720	+0.2	1.825	1.825	0
Carpenters	1.515	1.706	+12.61	1.510	1.515	+0.3	1.688	1.706	+1.07
Cement, per barrel	2.75	2.856	+3.85	2.74	2.75	+0.4	2.824	2.856	+1.13
Reinforcing Steel, cwt	2.79	3.343	+19.82	2.79	2.79	0	3.259	3.343	+2.58
Structural Steel, base	2.10	2.35	+11.90	2.10	2.10	0	2.35*	2.35	0
Sand, per ton	1.24	1.499	+20.89	1.24	1.24	0	1.405	1.499	+6.69
Lumber, 2x4 Fir, per M ft.	55.63	68.925	+23.90	55.87	55.63	−0.4	67.847	68.925	+1.59
Lumber, 2x4 Pine, per M ft.	53.84	67.181	+24.78	53.44	53.84	+0.7	60.90	67.181	+10.31
Common brick, per M	18.78	21.70	+15.55	18.51	18.78	+1.5	21.125	21.70	+2.72
Ready-mixed concrete, c.y.	7.66	8.242	+7.60	7.58	7.66	+1.1	8.071	8.242	+2.12
Struct. clay tile, 3x12x12	85.07	98.229	+15.47	84.75	85.07	+0.4	94.28	98.229	+3.81

‡ *Less than .05 percent change.* * *Incorrectly quoted last month. Price has been $2.35 since May.*

MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	July 1945	July 1946	% Change	June 1946	% Change June to July
Steel (% operating Capacity) A. I. S. I.	80.4	88.4	−1	75.7	+17

	May 1945	May 1946	% Change	Five Months 1945	Five Months 1946	% Change
Cement, thous. bbl. U. S. B. of Mines	9,272	16,083	+73	33,599	59,414	+77

	June 1945	June 1946	% Change	Six Months 1945	Six Months 1946	% Change
Fabricated Structural Steel, tons, A. I. S. C.	55,884	124,102	+122	333,249	644,478	+93
Building Permits, 215 Cities, Dun & Bradstreet (,000 Omitted)	83,226	192,785	+132	404,754	1,487,230	+267

COST OF LIVING . . . EMPLOYMENT

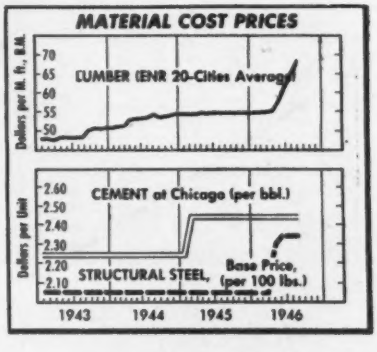
	June 1945	June 1946	% Change	May 1946	% Change May to June
Consumers Price Index, B L S	129.00	133.3	+3.3	131.5	+1.4
Rent (Housing) Index, B L S	108.3	108.5	+0.2	108.4	+0.1

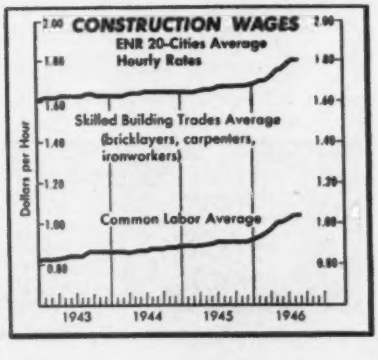
	June 1945	June 1946	% Change	Mar. 1946	% Change May to July
Constr. Employment (est.), thous., B L S*	970	2130	+119.6	1942	+9.7
Private Constr. Employment (est.), thous., B L S*	636	1828	187.4	1707	+7.1

* New series being used. For complete series, see July 25, 1946 *E N R*, page 49.

ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Aug., 1946	361.37	173.71	271.98	147.02	...	...
July, 1946	353.89	170.11	266.13	143.86	327	144
June, 1946	347.91	167.24	264.16	142.80	344	151
May, 1946	339.69	163.29	257.25	139.06	284	125
April, 1946	334.59	160.83	254.37	137.50	340	149
Mar., 1946	323.83	155.66	245.41	132.66	256	112
Feb., 1946	319.52	153.59	243.94	131.86	167	73
Jan., 1946	316.32	152.05	242.23	130.94	180	83
Dec., 1945	313.48	150.69	240.82	130.18	163	71
Nov., 1945	309.28	148.67	240.55	130.00	173	76
Oct., 1945	309.28	148.67	240.35	129.93	167	73
Sept., 1945	309.28	148.67	240.07	129.77	164	72
Aug., 1945	309.08	148.57	239.94	129.70	119	52
July, 1945	308.99	148.53	239.64	129.54	119	52
1945 (Av.)	307.74	147.93	239.14	129.27	123	54
1944 (Av.)	298.63	143.39	234.73	126.89	96	42
1943 (Av.)	289.95	139.38	228.75	123.66	176	77
1942 (Av.)	276.31	132.82	222.39	120.22	553	243

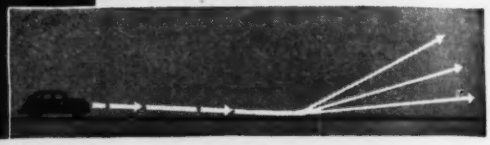




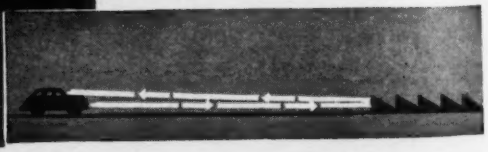
Here's why...

ATLAS WHITE REFLECTING CURB MAKES HIGHWAYS SAFER!

A smooth curb wastes the car's headlights. It reflects them away from the driver. Edge of road is difficult to see, and on rainy nights visibility is almost nil.



Light is conserved by White Concrete Reflecting Curb. Saw-tooth faces reflect the head-lamp rays *back* to the driver, forming a clear, bright outline at the road's edge. Rain makes this curb reflect even more light and so increases visibility just when it is needed most.



Only objects which *reflect* light, or are sources of light, are visible at night. The saw-tooth faces of White Reflecting Curb, made with Atlas White Cement, catch the rays from headlamps and reflect them *back* to the driver. Thus a continuous ribbon of light outlines the road's edge and guides the driver in greater safety along the highway.

Send for full details. Write to Atlas White Bureau, Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

ENR-RW-43

U. S. STEEL RADIO SHOW — Sunday Evenings — Consult your local newspaper for time and station

News of the Week

ENGINEERING NEWS-RECORD • AUGUST 8, 1946 • VOLUME 137 • NUMBER 6

CPA report indicates below-demand production for year

Monthly survey for June reveals production of building materials is increasing, but falling steadily behind estimated construction demand for remainder of year

Filling out the picture of continuing shortages in major building material items, a monthly report by the Civilian Production Administration issued last week indicated that production during 1946 probably will not be able to catch up with the tremendous existing demand.

The CPA report covered conditions as seen by government statisticians up to the month of June of this year. Placed in comparison with *Engineering News-Record's* recent surveys of the availability of building materials (*ENR* Aug. 1, vol. p. 131, and June 27, vol. p. 963) the report to some extent explains the currently dark supply situation.

Discussing lumber, CPA's statisticians said that production has consistently run ahead, month by month. They estimated that total production for the full year (barring major strikes or other disruptions) would be about 30 billion board feet, plus an additional 1 billion board feet obtained by import. However, estimated total demand for the year will top 37 billion board feet—and this figure would cover only partial lumber needs for restocking mills and yards.

This would indicate that total lumber supply for the year will be about 80 percent of total demand. *ENR's* August 1 survey showed that current supply in the hands of dealers is more than 50 percent below current demand.

An indication of how great is the demand for all materials is the fact that *Engineering News Record's* Construction Volume Index shows the volume for the first six months of 1946 running about 178 percent above that for the same period in 1945.

Other production figures

Listing other production figures, CPA said that softwood plywood production for June totalled about 120 million square feet, and that production of hardwood flooring declined sharply, from 25 million board feet in May to 20 million in June.

Brick supply declines

Brick and structural tile—supplies of which fell very sharply according to *ENR's* August 1 survey—reached production totalling 391 million brick and 93,000 tons of tile. CPA estimated that brick production for the first six months of the year—nearly 2 billion brick—was 78 percent of the total demand, while tile—about 498 thousand tons—was 73 percent of demand for the period.

Portland cement production was listed as rising to 16.5 million barrels for June, but shipments fell off to 14.6 million barrels, leaving producers' stocks about 10 million barrels lower than is normal for the half-year period.

Soil pipe production drops

Resulting primarily from the low level of production of pig iron and coke, production of cast-iron soil pipe dropped to 26,400 tons during June. In the first six months of the year, the industry produced 168,000 tons of this pipe and fittings—only one fourth of estimated requirements, according to CPA.

Other production figures included:

Wire nails—shipment of 53,000 tons of nails in June fell short of CPA's goal by 1,500 tons, due mostly to the duration of the coal strike; *cast-iron radiation*—increased slightly to 3.12 million square feet produced in June; *asphalt roofing and siding*—shipment of 6.5 million squares in June was highest level in industry's history; *plumbing fixtures*—June production of 86,000 bathtubs was slightly over May level, other basic fixtures declined; *warm-air furnaces*—declined to 48,700 units in June from 49,600 in May.

Order federal public works slowdown

Reconversion Director John R. Steelman on Aug. 6 ordered all agencies of the federal government to stop awarding construction contracts under the proposed $1,600,000,000 public works program. The order became effective immediately and extends to Oct. 1, 1946.

Mr. Steelman's order came as a response to a request by President Truman, who in a recent budget message said that government expenditures must be cut in order to bring that nation's expenditures into closer alignment with monetary receipts. The President's message had suggested that federal expenditures for public works construction be cut by about $700,000,000.

For the next 56 days, Mr. Steelman informed heads of all government construction agencies, no contract for any new construction can be awarded, without the express permission of the Office of War Mobilization and Reconversion.

Contracts already awarded and funds that have been committed for work scheduled to start before Oct. 1 will not be affected by terms of the directive imposing a "moratorium" on the letting of contracts for federal constuction. Mr. Steelman directed agency heads to subject their construction programs to a "rigorous screening" to eliminate all pojects not absolutely essential during the current fiscal year—and wherever possible to postpone starting any construction project until after April 1, 1947.

The OWMR chief also urged agencies making loans or grants to state and local groups to seek their cooperation in postponing public works construction wherever possible without jeopardizing health, safety or essential services.

Under the OWMR "Moratorium" directive, all construction agencies of the government must review and revise their construction expenditure estimates and submit them to the Civilian Production Administrator before the expiration of the "moratorium". Housing projects will be reviewed separately by the National

(Continued on page 74)

NEWS IN BRIEF

In telegraphic form, here are latest news developments on the engineering and construction front during the week.

Construction—The Reading RR Co. has received permission from the *Pennsylvania* Public Utility Commission to build a 985-ft. bridge at *Reading*, to cost $1,000,000 . . . New school buildings and improvements in *Delaware County, Pa.*, to cost $1,500,000 have been announced. . . . A state building program of $7,480,039 has been authorized in *Florida* . . . *Pinellas County, Fla.*, will build a 7-story, $850,000 addition to the Clearwater Courthouse. . . . The Johns-Manville Co. has awarded a contract for construction of a factory at *Natchez, Miss.*, estimated to cost $5,000,000. . . . A new city hall, 25 stories high, estimated to cost $3,500,000 is planned for *Jacksonville, Fla.* . . . The University of North Carolina at *Chapel Hill* plans 3 dormitories to house 900 students, at a cost of $1,200,000. . . . A new wood pulp mill is planned for *Blind River, Ont.*, to cost about $10,000,000. . . . A 45-acre site in the western outskirts of *Toronto, Ont.*, has been chosen for a $2,000,000 fruit and vegetable market. . . . Construction of a $9,000,000 paper mill near *Port Wentworth, Ga.*, for the Southern Paperboard Corp., is expected to start Sept. 1. . . . Preliminary plans are complete for the construction of a $3,000,000 hospital at *Knoxville, Tenn.*, and the city will soon apply for federal aid on it. . . . Georgia Power Co. plans a $4,000,000 steam-electric power plant with a capacity of 60,000 hp. at a site on the Flint River 10 miles south of *Albany, Ga.*

Housing—Bradley Real Estate Co. of *Montgomery, Ala.* has completed plans for the construction of 20 buildings, providing 110 apartment units at a cost of $1,000,000. . . . Harry Grossman will build a residential project to cost nearly $1,500,000 in *Philadelphia, Pa.* . . . A. W. Hopson, Inc. will build residential developments to cost $1,200,000 in *Sharon Hill* and *Springfield, Delaware County, Pa.* . . . Turner Construction Co. has been awarded a $4,000,000 contract to build an apartment house development in *Philadelphia, Pa.* . . . Phillip Green and Co., *Media, Pa.* will build a $1,000,000 residential development there. Ian Woodner Co., will build 599 homes in Llanerch Hills, *Upper Darby Township, Pa.* at a cost of $4,800,000.

Highways—*Highlands County, Fla.*, plans to improve 43.2 miles of its roads at a cost of $850,000. . . . Work has started on the western end of a new super-highway between *Fitchburg* and *Leominster, Mass.* . . . Work began July 25 on 1.47 miles of 6-lane highway of the new Penn-Lincoln parkway at *Pittsburgh, Pa.* . . . Construction and maintenance contracts of $1,856,119 for 347 miles of roads have been awarded by the *Arkansas* road commission.

Sewers and water supply—*Florida's* supreme court has affirmed validation of *Miami's* $23,846,000 in bonds for sewers, water disposal and other improvement. . . . *Opelika, Ala.*, will extend its present sewer system at a cost of approximately $575,000. . . . Scheduled for completion in 450 days and now ready for contractors for water works and power plant of *Parkersburg, W. Va.* . . . A contract has been let to enlarge the filtration plant of *Russell, Kan.* . . . Plans are almost ready for a $234,000 modern sewage disposal plant at *Hanford, Calif.* . . . Bids on the $1,800,000 water filtration plant at *San Diego, Calif.* will be called for late this month, city officials said.

Bond issues—*Knoxville, Tenn.* will vote soon on a $4,500,000 bond issue for construction of three new high schools. . . . *Kingsport, Tenn.*, has approved a bond issue of $2,400,000 for improvements to streets and playgrounds. . . . *Seattle, Wash.*, voters at the general election next November will consider a $3,000,000 bond issue to expand and improve the city's street lighting system. . . . Citizens of *Atlanta, Ga.*, and *Fulton County* are to vote August 14 on a proposed $40,400,000 bond issue for street, school, traffic, airport and civic improvements. These funds, together with expected $40,000,000 Federal funds, will finance the Lochner depressed express highway plan. . . . *Laramie County, Wyo.*, July 16 authorized a bond issue of $315,000 to modernize and enlarge a memorial hospital at *Cheyenne*. . . . *Prineville, Ore.*, has approved a $136,000 bond issue to help finance construction of a $157,000 sewer system.

Miscellany—The *Portland, Me.*, Port Authority is seeking bids on new specifications for expansion of the State Pier at a cost of $210,000. . . . The cost of the Union Pacific Railroad's current track relaying program involving some 350 miles in six of the eleven states served by the road is estimated at $7,500,000. . . . Mayor William F. Devin, of *Seattle, Wash.*, has asked the Municipal Board of Public Works to submit a report on recommendations that future public buildings be of earthquake resistant design.

Cascade Dam Site—*Across this section of the north fork of the Payette River in southern Idaho, the Bureau of Reclamation is constructing Cascade Dam. The right abutment of the $5,000,000 earth-fill structure will be placed against the far shore above. Working against a Nov. 15 snow-deadline, contractors are pushing a 410-ft. diversion outlet tunnel to create working space in the river bed. When completed, the dam will be 90 ft. high, 770-ft. long, with a 660 ft. base, and will create a lake 22 mi. long, storing 700,000 ac. ft. of water. Work on the dam, halted by wartime restrictions in 1942, was renewed early in 1946.*

Canada's housing needs remain critical

Canada's housing situation may not reach its most critical stage until 1947, reported C. D. Howe, minister of supply and reconstruction, in a review of the housing and building situation for the House of Commons.

Last year, 46,900 housing units were provided in Canada. The aim for the year to end March 31, 1947, is 60,000 and that for the following year at least 80,000 units, Mr. Howe said.

Mr. Howe outlined improvements to the government's lending arrangements and spoke of the recent consolidation of all federal government housing activities under the Central Mortgage and Housing Corps. He spoke also of the need for apprentices in the building trades and said that the present "squeeze" on the labor market will come to an end towards the end of 1947 or early in 1948. In 1933 there were only 24 construction apprentices is Canada and in 1939 only 100. Today there are 6,785 men in training.

Reviewing the materials situation, the minister said that the situation had shown improvement in the first five months of 1946. Nails are still in short supply and in view of the present strike in the Canadian steel industry, they would continue to be a critical material.

Plan $76 million Newark, N.J. airport

A proposal for the development of Newark Airport and the Port of Newark by the Port of New York Authority that would cost an estimated $76,400,000 was placed before the Newark City Commissioners July 31.

City authorities recently asked the port authority (an interstate entity established in 1921 for development of the New York-New Jersey port area) to submit a plan for taking over and operating the airport and the Port of Newark. New York City last week made a similar request to the authority, asking an investigation of the possibility of taking over both city-owned LaGuardia and Idlewild airfields.

Newark's present airport, virtually abandoned as a major air terminal with the opening of LaGuardia Field in New York City in 1940, was revived during the war period for use of Army planes, and has since obtained increasing traffic from airlines which have found the New York field too crowded for expanded schedules.

The improvement program would be financed by 30-year bonds of the Port of New York Authority.

The development plan calls for the complete reconstruction of the terminal into a field that will have three times the capacity of present facilities. The seaport, which adjoins the airport to the east, (see photo on this page), will also be rehabilitated with major improvements and new construction.

Principal elements of the airport redevelopment program will include:

Construction of six runways, ranging from 6400 to 9000 ft. each, to cost with accompanying taxi strips and aprons, about $31,000,000; expansion of the present 1400 acre field by 800 acres to the south, and across the Essex-Union county line in the vicinity of North Avenue and Humbolt Street in Elizabeth; a 76-acre central terminal area that will provide at least 40 plane loading positions averaging 150 ft. in width and will include a terminal building and a mile-long circular arcade through which passengers will move to and from plane loading ramps. The terminal building and arcade would have a total floor space of over 500,000 sq. ft.—fifteen times the floor area of the present Airport Administration building. In addition to facilities for passengers, the terminal would include, restaurants, recreational facilities, shops of all kinds, and modern appointments. Adequate automobile parking space will be available in the central terminal section and next to areas reserved for hangars and other service facilities.

Existing drainage ditches, made necessary by the marshy character of the land on which the present airport is situated, will be detoured from the central terminal area and to a large extent covered over. Port Authority engineers added that they had developed a special "cofferdam type" of construction for runways to permit them to withstand heavy plane loads despite the marshy character of the subsoil.

The cofferdam construction entails driving sheet piles 6 ft. into the marsh at each side of the 300-ft. wide runways, and tieing their tops together by long rods across the runway under the pavement.

If the development is approved, the new terminal would make a third major air terminal for the New York metropolitan area, now served principally by LaGuardia Field and eventually also by the big Idlewild airfield now under construction.

The seaport development program, to cost about $11,000,000, will include establishment of new roadbeds, rehabilitation of existing buildings, and construction of transit sheds, bulkheads and rail and road facilities.

Airport plans for Phoenix, Ariz.

The municipal aeronautics commission of Phoenix, Ariz., has approved and sent to the city commission plans for a new airport to cost about $1,200,000. It is expected that the federal government would pay at least 62 percent of the cost.

Included in the plan is a proposal for an air freight cold storage and quick freeze warehouse, emphasizing the possibility of commercial airline fast delivery of Arizona produce to the East.

Revoke newly-created Caribbean District

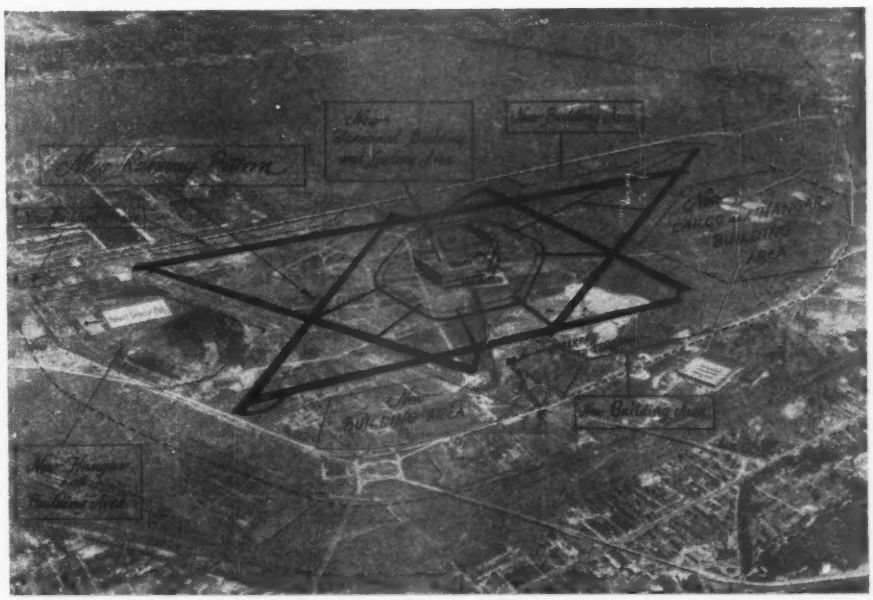
In a quick change of plans, the Office of the Chief of Engineers announced July 26 that the creation of the Caribbean Engineer District, announced some weeks ago (*ENR*, July 18, vol. p. 70), had been revoked, in favor of the creation of a district to be known as the Antilles District, APO 851 Miami, Fla., and the Panama District, Canal Zone.

Both of these new districts will be under the jurisdiction of the South Atlantic Division.

Col. Henry J. Woodbury is district engineer for the Antilles District, and Col. Donald D. Weinert is district engineer for the Panama District.

Colonel Woodbury was formerly with the Chicago District Engineer office, and Colonel Weinert in the Milwaukee district.

No immediate explanation was given for the change.



***Expansion plans**—The Port of New York Authority—a joint New York-New Jersey organization—has proposed to city commissioners of Newark, N. J., an elaborate program for a $76,400,000 rehabilitation of Newark Airport. Program includes construction of a central terminal building which will boast a mile-long circumference and provide 500,000 ft. of floor space. Improvements are also planned for the Port of Newark, located in inlet in upper left of photo. Work here will include rehabilitation of buildings, new bulkheading.*

Wind turbines seen cheap power source

Extensive detailed studies by the Federal Power Commission have revealed that cheap wind power may be generated to advantage by aerogenerators of between 5,000-kw. and 10,000-kw. capacity if the turbines are installed as feeders of large hydro-electric systems.

While no full size aerogenerators have been constructed, at least two permanent installations are planned, based upon the favorable conclusions of the studies just completed. The investigations also indicated that construction of the aerogenerators of the type proposed could be readily accomplished without special equipment, despite the great height of the supporting towers required.

Last year the FPC completed studies of the energy content of the wind with its patterns of flow and the economical utilization of wind power in existing utilities, the results being embodied in the monograph "Electric Power From the Wind, March 1945" (*ENR* May 31, 1945, p. 58). Following another year of work the agency has now completed a second report of 100 pages complete with drawings on the detailed design of a 6,500-kw. aerogenerator and entitled "The Wind Power Aerogenerator — Twin Wheels Catch Wind."

Twin Wheels Catch Wind

The design found most satisfactory calls for two 200-ft. diameter wheels with three fixed blades supported 203 ft. apart on a turntable somewhat resembling a swinging drawbridge and mounted atop a steel tower 475 ft. high. The wheels or "impellers" would revolve at a maximum rate of 47.5 rpm. All the generating machinery would be mounted in a large room above the turntable. The impellers would be operated at variable speed to drive a direct-current generator with the output converted to alternating power by an inverted synchronous converter.

With such a design the aerodynamic thrust per wheel was calculated at 90 tons, and the maximum horizontal hurricane load at the top of the tower at 350 tons. To withstand these large forces, a tower containing 650 tons of steel would be required, while the total weight of the bridge and the two wheels with equipment would be 760 tons, making the total weight of the entire installation about 1,410 tons.

Construction no special problem

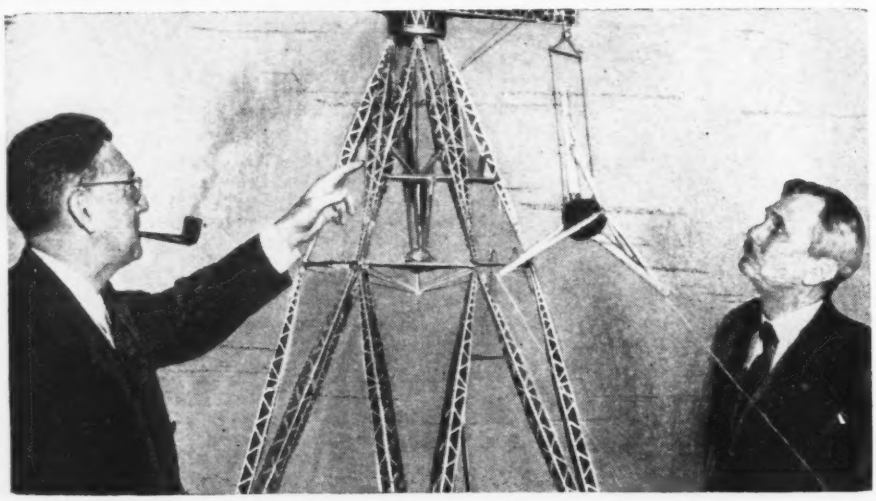
The 6-footed tower illustrated is said to be especially stable and easily adapted to ground irregularities. Erection studies with the model shown, plus other investigations, indicated that construction would be straight forward without special machinery required, the heaviest load to be handled totalling about 85 tons.

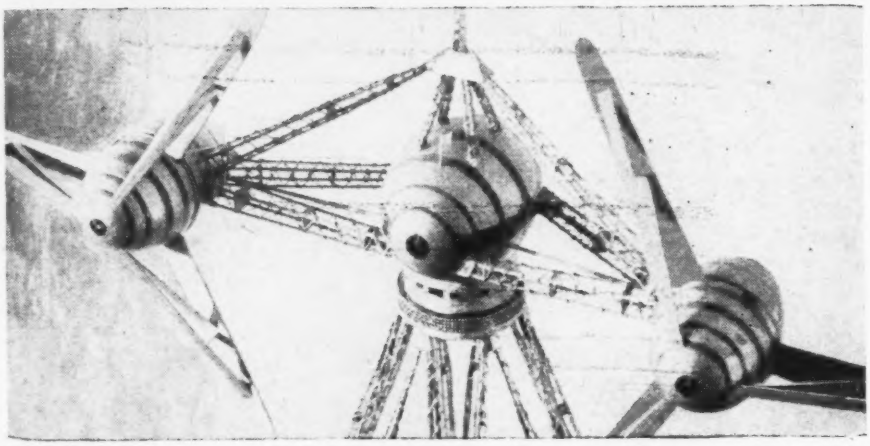
It is proposed to erect all spars, except two, in pairs connected to form an A-frame just as they fit in the finished structure. The A-frames would be hinged at the two free ends to assist in placing after hoisting. The main tower legs could be raised by a stiff leg and held temporarily by inclined struts until the horizontal bracing members at the 260-ft. level could be placed. The second tier of A-frames could then be raised by a 2-boom derrick located on the completed 260-ft. base.

Based on prewar prices and construction of ten units, the capital cost per kilowatt of maximum capacity is estimated at $75 for a turbine built to operate at maximum efficiency in a 28-mph. wind and $68 for an installation designed for greatest efficiency with a wind of 34 mph. These figures include 17 percent for overhead, indirect charges and profit. In their preparation the cost of structural steel erected was taken at $180 per ton.

The overall energy costs on a 50 percent load factor are estimated at about 1.3 mills per kilowatt-hour with 6 percent allowed for all fixed charges and 2 mills with 10.5 percent fixed charges. These figures include maintenance and supplies.

While the 6,500 kw. turbine is as large as considered appropriate for a first installation, studies indicated that no particular difficulties would be encountered in constructing larger sizes and that considerable saving in unit costs would result. All the detailed studies have been carried out by Percy H. Thomas, office of the chief engineer, Federal Power Commission. Copies of the reports mentioned may be obtained by writing the FPC, Washington 25, D. C.





***Wind-power Erection Methods Studied**—By means of a model the most desirable erection procedure for building a 6,500-kw. aerogenerator mounted on a steel tower 475 ft. high is studied by Commissioner Leland Olds (left) of the Federal Power Commission and Percy H. Thomas of FPC's office of the chief engineer. (Lower) Power will be developed by two 200-ft. dia. wheels each with three fixed blades. A special cowling is used at the center of the wheels or impellers to deflect wind outward toward the ends of the blades, thereby greatly increasing efficiency of the wheels.*

See $16 million Florida super-road

Construction of a $16,500,000 super-highway through the city of Jacksonville, Fla., has been outlined by W. M. Parker of Tallahassee, division engineer for the research and records divisions of the State Highway Department.

Featured in the new highway would be a 14-ft. park strip in the middle of a 100-ft. wide roadway that would extend for a distance of 15.7 miles. The new road would join the traffic from U. S. Route 1 and 90 in a continuous flow to practically eliminate need for traffic lights.

Bridges over the St. Johns and Trout rivers, and three overpasses would cost more than $7,000,000. Based on 1940 rental values, another $3,450,000 would be required to buy the right-of-way.

Parker said the new highway would correct Jacksonville's No. 1 traffic bottleneck—insufficient viaduct capacity over three railroad yards separating the business district from southwest Jacksonville (the Riverside area). Only three routes of traffic are partially open in each direction to serve 37 percent of the registered vehicles there.

A second traffic bottleneck also would be eliminated in that bridge openings cause a loss of 4,800,000 vehicle minutes each year at the Main Street bridge and 320,000 vehicle minutes at the St. Johns bridge. With the new lanes, the flow of traffic will be in one steady stream without loss of time.

Ideal access to rail, air and water facilities would be provided.

The engineer has recommended that the route be followed through a low rental area of Jacksonville, to make the right-of-way less expensive, and provide slum clearance.

Parker has submitted the over-all plan to a representative group of government and civic leaders in an effort to obtain their reaction. The routing has not been approved by either the State Road department or the Federal Bureau of Public Roads. The plan is merely an engineering analysis of the actual traffic situation in Jacksonville with a recommended solution, the engineer emphasized.

The state highway department has advanced a plan that would provide a 2775-ft. tunnel with 1000-ft. approaches at both ends, to eliminate present roads over the mountains for access to the south.

A survey by the University of Alabama's Bureau of Public Administration indicated that from 8,700 to 18,000 private passenger car crossings of Red Mountain would be made through the proposed tunnel each day. Commercial traffic crossings would range from 1,318 to 1,823.

Birmingham, Ala., plans $5 million road tunnel

Plans for a $5,000,000 self-liquidating highway tunnel, through Red Mountain (south of the city), to facilitate traffic flow in and out of Birmingham, Ala., have reached the "facts and figures" stage, according to the Red Mountain Tunnel Advisory Board.

The board said that it is now awaiting a report from Ole Singstad, New York tunnel expert.

Plan $25 million road through Richmond, Va.

Plans for an express highway for trucks and motor vehicles that will run through—rather than around—the city of Richmond, Va., have been completed by the state highway department and forwarded to the Public Roads Administration for approval.

The highway, which would cost about $25,000,000, would be a limited access roadway with connections to U. S. Route 360, 250, 460 and minor highways. The road would be carried across the winding James River on a 40-ft. wide causeway, and would be carried through the city in two 24-ft. paved strips, divided by a central parkway, and cut off from intersection with city streets.

Rising costs block road building in three states

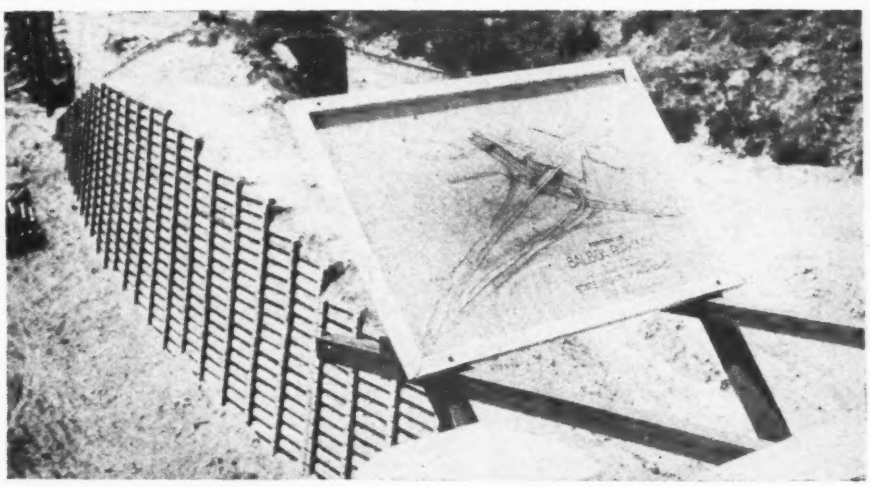
The high cost of labor and materials is reported to be blocking completion of elaborate highway construction programs in three more states.

In Maine, Lucius D. Barrows, chief engineer of the state highway commission, stated that the cost of manual labor is the greatest retarding factor in an elaborate program. Although contracts, approximating $2,500,000 have been awarded, Mr. Barrows expressed "grave doubt" that more than half of an available $2,000,000 fund for state aid work would be touched because of "prohibitive costs."

Up to July 18, the highway commission had awarded eleven bridge contracts in the amount of $516,057, and had rejected bids on several other projects as too high.

The possibility that the Arkansas state highway department will be unable to complete its current $12,000,000 road construction program this year because of an acute shortgage of materials and equipment, was indicated recently by Governor Laney.

The Washington state highway maintenance program is collapsing and the state highway department has ignored appeals for improvements, according to charges made recently by the Automobile Club of Washington. The club said that although state officials say they cannot obtain manpower and equipment for work, more than $4,000,000 has been allotted for maintenance. Principal complaint of the club is the condition of U. S. Highway No. 101 which loops the Olympic peninsula.



***For Sidewalk Supervision**—So that "sidewalk superintendents" may both see and understand operations on construction of the $1,338,000 Balboa Freeway—which will bring Pacific Coast traffic directly into the heart of San Diego—Mittry Bros. Construction Co., Los Angeles, has posted this artist's conception of the work on a bridge overlooking the job.*

PERSPECTIVE . . .

The Housing Picture

To the essentially simple mechanics of constructing a house in the U. S. has been added the vast complexity of government machinery, moving ponderously to relieve the nation's unprecedented and politically dangerous housing shortage.

In view of the almost frenzied hurry in which housing programs were pushed through the national lawmaking processes, and the other adjuncts of government-in-a-hurry, it is somewhat surprising, but nevertheless true that the job is being accomplished—at least by comparison with what has gone before.

The houses are not being built at the tremendous rate envisaged by Wilson W. Wyatt of the National Housing Administration — some 1,200,000 in 1946 and 1,500,000 (total) in 1947. Out of the mass of figures issued by federal agencies, it is difficult to measure exactly how many houses are actually under construction—and more important, how many will be completed. NHA's recent announcement of "approval" of more than 500,000 home construction projects in the first half of 1946 is admittedly no indicator as to how many of the 500,000 will be finished —or even started.

Engineering News-Record's own figures on contracts awarded for the first five months of 1946 indicate that mass housing projects alone totalled $662,000,000—already nearly twice the entire post-depression record year of 1939. Figured at an average cost of $6,000 per housing unit (a low estimate), this would indicate about 100,000 homes under construction during the 5-month period, with some prospect of completion—or, if the trend continues, perhaps 300,000 for the full year. Add to this the generous estimates of 100,000 conversions, 100,000 "temporary re-use" structures 20,000 prefabs—the total still falls far short of the 1,200,000-mark.

But, in comparison with the previous five years, the rate of construction is very great. The houses are being built. Space limitations preclude discussion of how well they are being built—though obviously a good deal of shoddy material and workmanship is going into them.

Blocking the path toward any goal is the major problem of materials. Despite optimisic reports, and notwithstanding premium payments to certain manufacturers, materials are not yet in sufficient supply to support a housing program of the size urged. Labor, at the moment, seems to be adequate, but there are numerous indications that this situation is only true because shortages of materials have curtailed the amount of work.

Most regulations issued by the various housing agencies are aimed at relieving the shortage bottleneck. Some have been partially successful, and many have not been in force long enough to prove their effectiveness. However, independent surveys conducted by this journal show that the materials are not yet reaching the small distributors who service individual contractors.

Rules and regulations

If he wishes to build a house today—even if he has on hand some of the materials required—any builder must take account of these major regulations now in force:

Veterans Housing Program Order 1. Placed in effect March 26. A builder wishing to construct or repair an existing single-unit dwelling costing more than $400 must obtain Civilian Production Administration approval. In 2-unit and larger dwellings, similar cost ceilings are in force (*ENR* March 28, vol. p. 441) and approval must be obtained to replace homes destroyed by fire, flood and similar causes. Application to build must be made on CPA form 4386, the application to be filed with a regional office of the Federal Housing Administration.

HH priority. If the application is approved, approval permits the builder to use an HH priority in accordance with Priorities Regulation 33, established Jan. 15 (*ENR* Jan. 10, vol. p. 13) to aid in obtaining critical materials.

HHH priority. Established July 25, (*ENR* Aug. 1, vol. p. 140) applying to builders needing materials for the special program of converting Army and Navy barracks and other housing to veterans' use.

Added up, the orders represent a real, if slightly makeshift, effort to aid the builder. But the government must keep the supply of components —the nails, the bathtubs, the shingles and the boards, etc.—flowing to the builder.—*E.E.H.*

Order slowdown in federal construction

(*Continued from page 69*)

Housing Expediter. Following this review, the CPA administrator and the NHA expediter will recommend to Mr. Steelman the projects and programs which should be allowed to start between Oct. 1, 1946 and March 31, 1947. After study of these recommendations, the Reconversion Director will direct the two subsidiary agencies to proceed with approved, non-deferrable projects.

Mr. Steelman made it clear that work will not be stopped or delayed during the "moratorium" period on any construction that is already under way. New commitments will be authorized during the period for certain categories of construction—including urgently needed hospitals for veterans, overseas military projects, the Manhattan project, the Veterans Housing Program, etc. Commitments on small projects costing $3,000 or less will also be permitted.

The effect of this reduction in contract awards will be to cut the $1,600,000,000 program to approximately $900,000,000.

Uphold city law requiring local paving mix plants

A city paving specification at Trenton, N. J., that requires contractors to maintain asphalt mixing plants within that city's limits was declared "not unreasonable" last week by the State Supreme Court.

Claiming that the "discriminatory" specification would cost taxpayers an extra 20 percent on the city's $851,000 repaving program, the Kingston Bituminous Products Co. of Kingston, Pa., and two taxpayers carried the suit to the state's highest court. The Pennsylvania firm contended it had submitted the low bid on each of five Trenton street jobs on June 14. It withdrew the bid when the city commission refused to drop the ruling and the Supreme Court held that there was no specific evidence to prove that the bids were lower.

Plan bridge survey for North Carolina

Because many of North Carolina's 16,000 county road bridges have reached what Chief Highway Engineer W. Vance Baise describes as a "critical" condition because of natural deterioration, lack of maintenance due to materials, labor and equipment shortages, division highway engineers met at Raleigh, recently and mapped plans for conducting a statewide bridge survey.

Price increases allowed on building materials

The Office of Price Administration last week announced a number of ceiling price increases, decontrol actions and miscellaneous orders on construction supplies that were under consideration on June 30 before the former price control act expired.

The actions listed are based on standards in existence as of June 30, and do not relate to the new law under which OPA is now operating.

Price increases were permitted on materials including the following:

Southern pine car material and framing—ceiling prices increased $8 and $5 per 1000 board feet to restore customary differentials and increase short supplies; *fiber insulation board products*—manufacturers' ceilings increased slightly over 10 percent; increases range from $2 to $13 per 1000 sq. ft.; *insulating fire brick*—increases of 20.1 percent and 21.6 percent to cover average total costs; *packaged cement*—additional producers' ceiling prices increased five cents per barrel in the portion of the United States east of but not including the states of Montana, Wyoming, Colorado and New Mexico.

Vitrified clay sewer pipe and allied products in West Central and Rocky Mountain areas—ceiling prices raised about 24.5 percent over March 1942; *convector radiators*—maximum prices increased 10 percent over March 1942; *wire nails and fence wire*—resale prices out under the same percentage mark-up provisions governing reselling of other types of merchants wire products, instead of dollar-and-cent mark-ups as heretofore; *cork insulation board*—ceiling price increased $1.70 per 100 board feet; *hardwood grade lumber* produced in North Central hardwood lumber region—ceiling prices uniformly increased 6 percent.

Montana hospital contract signed by Army Engineers

The Corps of Engineers has announced recently that it has signed a contract with the A. V. McIver, Cushing and Terrell Co. of Great Falls, Mont., to act as architect-engineers for a $2,750,000 veterans hospital to be built at Miles City, Mont.

The corps also announced that the Veterans Administration recently turned over to it the preparation of plans and specifications for five more hospitals, on some of which the Veterans Administration previously had asked for bids, but had rejected the tenders offered.

Acme Newspictures

***Let 'er Blow**—Ready to go to work in the interests of aeronautical science is the world's largest wind tunnel, recently dedicated at Moffett Field, Calif. Built for the National Advisory Committee for Aeronautics ENR Sept. 20, 1945, vol. p. 362) machines within the tunnel can produce velocities of 720 mph or greater for study of flight at greater than the speed of sound.*

Midwest material supply follows downward trend

Following the trend established by two previous surveys by *Engineering News-Record* (Aug. 1, vol. p. 131) materials available for building construction are far below demand in Kansas, Oklahoma and Western Missouri, a further spot-check, conducted at Kansas City, Wichita and Tulsa showed last week.

As in the previous nation-wide survey, the check showed lumber and plywood almost unavailable, and labor maintaining a precarious balance with demand. Lumber is so short in Tulsa and Oklahoma City, in fact, that many lumber yards have ceased advertising anything but minor fittings and some trim.

Deviating slightly, however, from the nation-wide survey, were reports indicating that brick and tile products apparently are more readily available in the three states than elsewhere, although the general supply is still some 25 percent below demand. Movements are afoot in Missouri to obtain approval for use of native stones not normally used in home construction.

Steel supplies are "far below" demand, and although cement plants in the area are reported operating at full capacity, the supply of this commodity also has fallen below requirements the survey indicated.

Engineers push harbor rehabilitation work

Turning to the completion of work deferred by the more pressing needs of war, the Army Engineers last week announced harbor improvement operations scheduled for ten Pacific Northwest and Alaskan locations, during the next five months.

Col. L. H. Hewitt, Seattle district engineer, said that dredging had already started in Seattle harbor at the head of the Mead waterway to remove shoaling in a turning basin at the junction of East and Duwamish waterways to a depth of 30 ft. mean low water.

Other work in progress or due to be started soon includes:

Emergency dredging of a channel from deep water in Grays Harbor into Westhaven Cove, near Westport, Wash.; improvement to the alignment of the present navigation channel at Wrangell Narrows, Alaska; that will include enlargement of the present channel to 24 ft. depth and 300 ft. width for a distance of 8¾ miles; reconstruction of revetments protecting Nome, Alaska harbor, and harbor dredging at Nome, and a dredging and snagging project on the North and South Forks of the Skagit River, in Washington.

Florida plans waterfront work

A $3,288,000 plan for utilization and beautification of the waterfront of Jacksonville, Fla., which will provide an additional 19 acres of new land for city and county purposes and may untangle the present traffic snarl, is now under consideration by the Duval county board of commissioners.

The plan suggests building land out to the present pierhead line to accommodate two new streets, which would create new land for erection of city and county buildings.

Finances and shortages delay Toronto survey

A $25,000,000 subway project at Toronto, Ont., is not now expected to get under way this year, officials said last week. They blamed the delay on the dominion government, which has been slow in taking action with regard to the grant of financial aid for the work, and on shortage of labor and materials.

Contract plans for the first section of the subway, according to the Toronto Transportation Commission, have been ready for bids for some time but no bids will be asked until there is assurance of adequate labor and material supply for the entire project as well as financial aid from the federal government.

See permanent Inter-American body

Regional conference at Caracas in September expected to formalize organization of sanitary group

Formation of a permanent Inter-American organization of sanitary engineers is expected at a regional conference to be held in Caracas, Venezuela, from Sept. 26 to Oct. 2. The meeting is being sponsored by the Ministerio de Sanidad y Asistencia Social in Venezuela, the Institute of Inter-American Affairs and the Pan-American Sanitary Bureau.

An earlier meeting at Rio de Janeiro, Brazil, attended by some 200 engineers, laid the groundwork for a permanent organization to facilitate closer relations among South, Central and North American sanitary engineers (*ENR* July 4, vol. p. 4).

The Caracas conference will be for engineers of Colombia, Ecuador, Venezuela, Panama, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua and the United States.

The Water and Sewage Works Manufacturers Association, which previously voted a $10,000 fund to aid in financing both conferences, plans to conduct an exhibit at the Caracas meeting.

Among the representatives from the United States who will attend are C. T. Butterfield and L. A. Fisher of the U. S. Public Health Service, Prof. Abel Wolman of The Johns Hopkins University, Donald L. Snow of the Pan-American Sanitary Bureau and C. I. Sterling, Jr., of the Institute of Inter-American Affairs all of whom will present papers. The institute is sending in addition two or three prominent North American sanitary engineers as consultants to the conference.

Information concerning the technical program and other details may be obtained from Clarence I. Sterling, Jr., chief engineer—associate director, division of health and sanitation, Institute of Inter-American Affairs, 499 Pennsylvania Ave., N. W., Washington 25, D. C.

Akron plans big park at water supply reservoir

Plans for a recreational park at the Geauga Lake reservoir, to be operated by the water board of Akron, Ohio, have been announced by Wendell R. LaDue, superintendent and chief engineer of the city's bureau of water and sewage.

The project would involve building a large dam at Hiram Rapids to flood 8,000 acres of land in Geauga County, creating one of the largest artificial lakes in northern Ohio. The project is estimated to cost over $8,000,000.

Congress favors hospital program of $1,125,000,000

A 5-year, $1,125,000,000 hospital construction program outlined in the so-called Hill-Burton Bill needs only presidential approval to become effective, as both houses of Congress have completed favorable action on it.

The legislation authorizes the federal government to pay one-third of the cost of building or equipping new hospitals and appropriates $375,000,000 for the government's share of financing it. Two-thirds must be contributed by sponsors of individual projects, and private, non-profit hospitals may share in the program as well as state, county and city institutions.

States will share on a basis of need.

Senator Lister Hill, of Alabama, one of the authors of the bill, said passage of the measure "represents the first time Congress ever has approved variable grants to the States, and sets a precedent of distributing federal funds on the basis of need."

Previously, state-federal cooperative programs have required dollar-for-dollar matching.

Appropriate $500,000 for Honolulu sewer plans

Honolulu, Hawaii, is considering a modern sewage system estimated to cost $9,400,000. Recently President Truman made available to the city 13 acres of land on Sand Island in Honolulu harbor for use as a treatment plant site.

The city supervisors have been considering charging industrial users of the system, although present service is free.

Half a million dollars already has been appropriated to draw up plans for the system. Plans are to be completed by Dec. 31. Metcalf & Eddy, consulting engineers of Boston, Mass., are drafting the plans and specifications for the plant itself, which will provide primary treatment with separate sludge digestion. Under the contract they will receive $272,500. Austin & Towill, Honolulu, have been awarded a $217,500 contract to prepare plans and specifications for new sewer mains in Honolulu and for connecting the system with the disposal plant.

At present, Honolulu sewage is collected into two main outfall lines which empty into the sea beyond the harbor mouth.

The 1947 territorial legislature will be asked to provide the necessary funds, probably by a bond issue. Completion of the new system is expected to take five years. Cost estimates run from $9,400,000 upward.

Report further actions in anti-pollution drive

Indicating continuing growth of anti-stream pollution programs throughout the country last week were actions taken by widely scattered agencies to further implement such programs.

Many states, including Indiana, Tennessee, Pennsylvania, West Virginia, and others, have already adopted formal anti-pollution laws, and New York state recently announced (*ENR* Aug. 1, vol. p. 137) that its legislators would consider a stream pollution law at their next session. Developments during the week included:

In Ohio, the Ohio Conservation and Natural Resources Commission adopted a recommendation that indicated that the state does not plan to go to court in an attempt to halt pollution of Summit Lake and the Ohio Canal at Akron. An investigation of the two state-owned bodies of water, made recently under a ruling by the State Attorney General that the state could bring legal action to enjoin firms or municipalities from polluting bodies of water, said that since the main purpose of Summit Lake and Ohio Canal was to furnish water for industries and recreation value was of little importance the state should not prosecute.

At Miami, Fla., city officials said that construction of the city's $17,000,000 sanitary sewer system probably will get underway on schedule, with initial bids already under consideration. The initial portion of the job will call for the laying of about $1,000,000 worth of sewer laterals and interceptors.

In Indiana, the Stream Pollution Board approved preliminary plans for sewers and sewage treatment at the cities of Portland and Carlisle.

Beam named manager of "Civil Engineering"

Carl E. Beam, who recently returned to the staff of the American Society of Civil Engineers from service in the Navy, has been named manager of *Civil Engineering*, and Allen J. Wagner, public relations assistant to the secretary, has been appointed editor of the society's monthly journal.

These changes mark a separation of the editorial functions of the magazine from all other technical publications of the ASCE. Formerly they were all grouped under the direction of Sydney Wilmot, who acted as editor-in-chief and manager. Mr. Wilmot now becomes manager of technical publications and Harold T. Larsen is editor. Don P. Reynolds, associate editor of *Civil Engineering*, continues in that capacity.

OBITUARY

Jay Mitchell Crabbs, 66, Painesville, Ohio, civil engineer, died July 24. He was engineer for the villages of Fairport, Richmond, Kirtland Hills, and Waite Hill. He did all of the layout work for the Diamond Alkali Co. and the Fairport, Painesville & Eastern Railroad. He also did engineering work in the layout of roads in Yellowstone National Park. He had lately been operating his own business with his son, Robert, recently discharged from the Navy.

Walter A. Shea, 60, construction engineer for many years with William Doyle and Co. contractors and builders, died July 8 at Philadelphia, Pa. More recently, until his retirement two years ago, he was with the Federal Housing Administration.

George N. Hawkins, 67, president of the Akron, Ohio, City Planning Commission, died July 15.

Norton Quincy Sloan, 61, Dayton, Ohio, engineer who supervised construction of the Dayton Art Institute, died July 24.

George W. Borden, 64, who helped design the heavy runway at the Fairfield-Suisun Air Base, died recently in Sacramento, Calif. As head of the Airfields Design Section at the United States Engineer office, Sacramento district, Borden also worked on air strips at Mather, McClellan and other Army airports in central California. He began his engineering career in 1907 and for six years he was chief executive for the Nevada State Highway Department. He also worked eight years with the National Park Service and at one time represented the Shell Oil Co. on engineering projects in Argentina.

Adm. Kirby Smith leaves post as housing deputy

Rear Admiral Kirby Smith (CEC,) USNR, who became deputy housing expediter for the Veterans Emergency Housing Program last April (*ENR* April 18, vol. p. 535), has resigned the post to return to private employment.

Admiral Smith, director of the Construction Division of the Bureau of Yards and Docks during the war, returned to the Navy's inactive list in December, and was called to aid the housing program shortly thereafter.

Approve standard prefab construction code

A code for prefabricated construction, in a form suitable for addition to existing basic building codes, was approved by the Prefabricated Home Manufacturers' Institute at their recent summer meeting at Hamilton, Ont.

The code is intended to assure conformance with "high standards of safety, comfort and health, without setting up unnecessary and burdensome restrictions, certifications and other paper work requirements that would materially increase the cost of prefabricated homes."

In discussing problems of distribution, Austin Drewry of New Albany, Ind., warned against letting the federal guaranteed market program stand in the way of working out now all details of a sound distribution method. James L. Pease, director of the Prefabrication Production Board of the National Housing Agency, added that the guaranteed program is no "bonanza" for anyone, and advised against "rushing into a contract without first finding out the requirements." Mr. Pease pointed out that the contracts, as now prepared, require a 30-day notification to the government if houses are to be taken over, and, the manufacturer may be required to store houses for a 60-day period at his own expense.

Calendar of Meetings

NATIONAL

Building Officials Conference of America, annual convention, Peabody Hotel, Memphis, Tenn., Sept. 2-5.

The Producers' Council, Inc., fall meeting, Hotel Pennsylvania, New York, N. Y., Sept. 25-26.

REGIONAL

Pennsylvania Sewage Works Association, annual meeting, Pennsylvania State College, State College, Pa., Aug. 28-30.

American Water Works Association, Southeastern Section, DeSoto Hotel, Savannah, Ga., Sept. 9-11.

American Water Works Association, Western Pennsylvania Section, Roosevelt Hotel, Pittsburgh, Pa., Sept. 12-13.

American Water Works Association, Rocky Mountain Section, La Fonda Hotel, Santa Fe, N. M., Sept. 12-13.

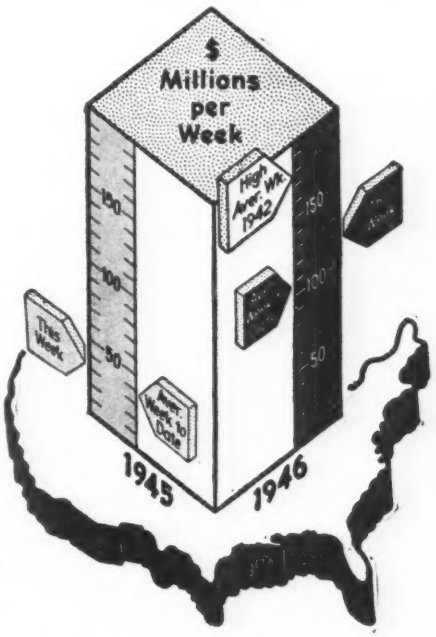
Georgia Water and Sewage Association, annual meeting, in conjunction with 15th annual Georgia Water and Sewage School, Georgia Institute of Technology, Atlanta, Ga., Sept. 16-18.

New England Water Works Association, 65th annual conference, Poland Spring House, Poland Spring, Maine, Sept. 16-20.

American Water Works Association, Michigan Section, Park Place Hotel, Traverse City, Mich., Sept. 18-20.

American Water Works Association, Four-States Section, Brunswick Hotel, Lancaster, Pa., Sept. 27-28.

CONSTRUCTION ACTIVITY



As Reported this week to ... *Engineering News-Record*

CONTRACT VOLUME

Continental U. S. Only (Thousands of Dollars)

	Week of August 8 1946	Cumulative 1946 (32 wks.)	Cumulative 1945 (32 wks.)
Federal	$7,091	$500,850	$616,001
State & Mun.	43,727	858,862	191,064
Total Public	$50,818	$1,359,712	$807,065
Total Private	68,815	2,044,413	346,609
U. S. Total	**$119,633**	**$3,404,125**	**$1,153,674**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Dollar Volume (Thousands)

Type of Work	This Week	Cumulative 1946 (32 wks.)	Cumulative 1945 (32 wks.)
Waterworks	$1,566	$63,040	$29,557
Sewerage	1,993	61,830	19,333
Bridges	3,914	82,007	20,609
Highways	27,726	499,989	133,720
Earthwork, Waterways	3,346	284,615	28,304
Buildings, Public	6,782	246,272	378,649
Industrial	23,082	643,996	226,122
Commercial	42,808	1,276,071	72,417
Unclassified	8,416	246,305	244,963

NOTE: Minimum size projects included are: Waterworks and waterway projects, $22,500; other public works, $40,000; industrial buildings, $55,000; other buildings, $205,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1946 (32 wks.)	Cumulative 1945 (32 wks.)
NON-FEDERAL	$1,063,086	$500,764
Corporate Securities	303,368	91,408
State and Municipal	534,718	245,756
RFC Loans	.....	24,600
REA Loans	.....	60,000
Fed. Aid Highway	225,000	79,000
FEDERAL	1,373,229	1,014,412
Total Capital	$2,436,315	$1,515,176

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	August '46	361.37	173.71
Building Cost	August '46	271.98	147.02
Volume	July '46	327	144

EDITORIALS

VOLUME 137 NUMBER 6

August 8, 1946

Public Relations Responsibility

ENGINEERS have themselves to blame for the relatively little the public knows about their profession. A move toward better popular understanding is the present policy of the ASCE in having members of the Board of Direction speak to service clubs and otherwise to capitalize on public relations opportunities. The latter are to be found in the topics discussed at quarterly meetings of the society or in the importance of those in attendance. This policy paid dividends at the recent Spokane meeting if a large amount of space in daily newspapers is a criterion. While this policy of the ASCE is most commendable it is only a start; lasting effect requires years of this effort and nationwide participation in the move by all engineers. We cannot expect understanding if we evade public relation responsibilities.

International Sightseeing

THERE is no better adjunct to education than seeing how other people do things, particularly while one is in the receptive status of a student. Thus it is significant that the United States is host to junior civil engineering students from Sweden, most of whom borrowed the money to make the 3,400-mile journey. Not only have they studied our engineering and construction practice, but they also had an opportunity to scrutinize our ways of living and thinking. We are pleased that they came and proud that they feel what was learned was well worth its cost. We hope that other students can come to our country and that more of our own students will visit Sweden and other countries that are making important contributions to civil engineering and construction.

Looking Back on Public Works Planning

THE RECORD of New York State's pioneer venture in stimulating public works planning by matching funds with local municipalities, described on p. 85 of this issue, indicates that the plan has been eminently successful. On July 1, when applications were terminated, some 3,600 projects, with an estimated construction cost of $278 million, had been approved. It is also to be noted that after 3½ years of experience the Postwar Public Works Planning Commission, under whom the program was directed, finds that the original policies and procedures for this unique state-local government relationship were soundly conceived and would not be materially changed if another program were undertaken. It will be recalled that New York initiated this program in 1943 at a time when everybody was talking about postwar public works planning but virtually nothing tangible was being accomplished. Eight other states finally took an active role in promoting local-works planning with financial aid, but the majority waited on the federal government for a handout; the fact that the federal debt was increasing and state debts decreasing had no influence in stilling the clamor for federal aid for municipal works planning. That such aid was and is unnecessary has been stated before in these pages. Proof of this is to be found in New York State, which had the will to help cities help themselves.

Compromise Needed

UNDER THE CURRENT federal-aid highway legislation a considerable part of the federal money allocated to each state is to be spent on main highways into and through cities. This means that plans of the state highway departments for routes leading into the cities must be integrated with planning of the city public-works departments or plan commissions. Already there have been instances in which state highway engineers have quite different ideas from those of the city engineers as to the routes to be followed within municipal areas. There will be other differences as the urban highway program expands. If the program is to succeed, these differences will have to be taken up in an atmosphere of mutual respect and willingness to compromise.

Reduced Chlorination Costs?

LOS ANGELES OFFICIALS are enthusiastic about results obtained from a chlorinated hydro-carbon product discovered in a search for a speedy, convenient, low-cost bactericide. (See p. 83) Some interesting claims are made as to the action of this chemical on sewage, particularly in emulsifying greases and thus breaking up the protective coating around bacteria. Incidental results are

said to be preventing formation of hydrogen sulphide and facilitating more than the usual bacterial reduction on admixture with sea water. These are objectives highly to be desired. If results confirm early hopes, there could be a far-reaching effect on pretreatment of sewage by chemical dosage before it reaches disposal plants. However, in chemical and bacteriological analyses interpretation of results calls for the greatest skill to avoid misleading conclusions. It is logical that Los Angeles, while giving every opportunity for thorough exploration of the new treatment program, should have decided to continue construction of the originally proposed chlorination plant at the ocean outfall.

Safety on the Highway

MUCH HAS BEEN WRITTEN about building safety into new highways, and current designs almost universally incorporate proper sight distances, limited curvature, non-skid pavement and many other features that make a highway safe for high-speed and dense-volume traffic. But building safety into new highways is a solution for only a small fraction of the problem. Something must be done to make driving safer on thousands of miles of highways that were built to design requirements now considered obsolete.

All too often a defeatist attitude is taken toward safety measures on existing highways, with the result that few if any corrective measures are taken. This is inexcusable because there are many traffic hazards that can be eliminated if proper study is given to factors that make for accidents.

In studying conditions on existing streets and highways it is well to keep in mind the old maxim that anything contributing to the confusion of the motorist decreases safety. Among such contributory factors are route markers with lettering too small or too congested for easy reading at normal travel speeds as well as signs too close to intersections to permit the driver to watch cross-traffic while trying to ascertain a route direction. Occasionally, where large directional signs are used, they are so placed as to partly obscure approaching vehicles on the cross highway.

Continued reductions in traffic accidents can be accomplished, but only through the untiring efforts of all those who plan and build the highways, those who enforce the traffic regulations as well as those who use the highways.

Consultants vs. Civil Service

THE CALIFORNIA SUPREME COURT rendered a service to all professional engineers by its recent decision upholding the right of San Francisco to engage outside consultants to do engineering work (*ENR* July 25, vol. p. 87). The court held that the city is not required to have all its engineering work done by civil-service employees and that it can enter into contracts with specialists without calling for bids. The court's decision was rendered in a suit inaugurated by civil service employees in an attempt to invalidate a contract for the design of a sewage-disposal plant let to a private consultant.

The issue raised by these civil-service employees is not new; it has been raised before in other cities with large engineering staffs, notably New York. For that reason it appears desirable to restate what appear to be the fundamental principles that should govern. Governmental agencies should have the right to employ outside consultants for engineering work regardless of whether or not the agency has an engineering department. But that right should not be abused. It should not be used as a means for handing attractive architectural or engineering work to favorite consultants, nor should it be used so frequently as to deprive a city's regular engineering or architectural departments of all stimulating work, leaving only routine engineering to the engineers and architects in civil service.

Independent consultants perform a very useful function, hence everything that can be done within reason should be done to keep them as an element of our national economy. Nevertheless, the engineering work done by public-works departments also is an essential part of our economic system, and if those departments are to attract and hold able engineers they must offer them opportunities to engage in stimulating work. As a general rule, consultants should be employed only for special work or for projects beyond the scope of a town or city's engineering department.

So long as the rights that the court restated are not abused, there should be no conflict between engineers in private practice and those in civil service.

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Seven-Mile El Mirador Tunnel in Mexico

***Contents in Brief**—U. S. equipment and methods are being used in Mexico on a seven-mile irrigation tunnel, driven largely through plastic shale that played havoc with timbering. Work is carried on from two portals and an adit and will be practically completed by August. The tunnel will carry water for irrigation of 100,000 acres.*

ADEQUATE tunnel forming and concreting equipment have been a major factor in enabling Constructora Rosoff, S. A. to complete the seven-mile El Mirador irrigation tunnel near Puebla, Mexico by August, well ahead of the fall dry season. The tunnel is part of the $11,000,000 Valsequillo irrigation project that will provide water for 100,000 acres of Mexican lands. The project includes an earth and rock-fill dam, built by day labor forces of the Mexican government, and a system of canals, constructed generally by contract.

El Mirador tunnel is circular in cross section and has an inside diameter of a little more than 16 ft. The tunnel generally is more than 300 ft. below the surface. Advantage is taken of rough topography to provide one central adit, in addition to the portals, for access to the tunnel. The tunnel has been holed through and concreting is now being completed.

Water was stored during the Mexican rainy season and all of the works are to be in usable condition by the time irrigation water is required during the late fall and winter months. Farming in the area now is confined to the wet spring months, but with irrigation year-around farming can be carried on. Provision is being made in the installation for eventual additions of equipment for the generation of power, but none is being installed at present.

As no electric power was available for use on the project, a 3,000-kw. steam-turbine generator plant was built to supply necessary light and power for construction.

Excavation was carried on both ways from the adit and from both portals with all headings worked full-face. Muck was hauled directly out of the tunnels by diesel and electric-battery locomotives. At the adit, a long 3 percent grade up was necessary. For hauling up this slope, some of the battery locomotives were converted for use with trolleys, the motor-generator sets normally used for charging the batteries being adapted for supplying the required power.

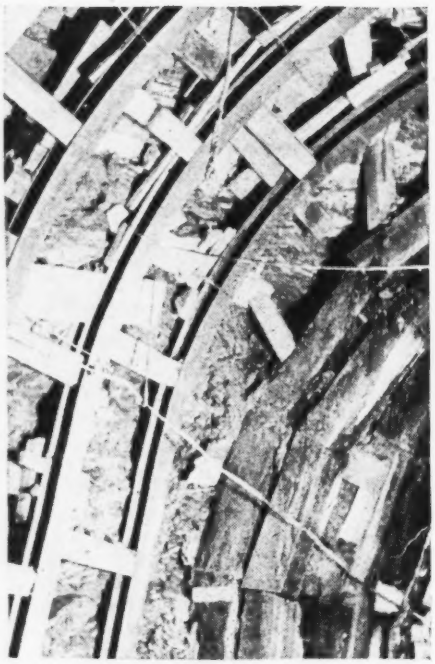


Fig. 2. Pressure from flow of plastic shale was great enough to push in the double timbering, making it necessary to replace the timber with steel.

Blaw-Knox photo

Fig. 1. Arch concreting set-up: belt conveyor, hopper and pneumatic placer at left; air receiver at right. Note discharge pipe from the placer (left center) rising at an angle toward the form.

Plastic shale caused difficulty

Shale—plastic enough to flow and with weight great enough to raise havoc with the heaviest timbering—was encountered for three-fourths of the tunnel length, while a limestone conglomerate, not requiring support, made up the rest of the tunnel.

At the time the work was started it was not possible to get steel for supporting the tunnel roof. Consequently, timber supports were used, some 16,000,000 b. ft. of heavy timber having been obtained by selective cutting from a government forest reserva-

Blaw-Knox photo

Fig. 3. Incline leading up to the traveling "California switch" platform, the air hoist at the left is used to pull the platform ahead.

tion. The timber was hand hewn.

Plastic flow in the shale during the several months between excavation and concreting pushed in even double rings of this heavy timber. Finally about 2,000 tons of steel was used to replace the timber supports to obtain the full cross-section area of the tunnel.

The plan followed in concreting is to pour curbs outside the tunnel line to support rails for an invert bridge, then clean up the muck from the invert with a diesel bulldozer working from the portal to the adit, where the muck is hauled out.

Equipment grouped for speed

A small concrete plant was set up at one portal (later moved to the other portal) to mix concrete for the invert, which is poured to a 40 deg. arc on each side of the centerline. Invert concrete is taken into the tunnel in 5-cu. yd. electrically-operated agitator units pulled by locomotives operating on 36-in. gage track. Placing of the invert concrete, generally, started at the portals—the point of concrete supply—and advanced toward the adit following the invert cleanup. Steel forms were used for the radial construction joints of the 18-in. thick invert and were held in place by $\frac{3}{4}$-in. lag-threaded anchor bolts that tied them down to the previously cast concrete curbs.

Originally, it was planned that the invert would be placed from three separate concreting bridges operating on rails on the curbs. By the time cement was received and concreting could be started, however, it appeared that pouring could be speeded by consolidating the three invert units into one bridge, which permitted placing 400 lin. ft. at a time.

Approaching the point where the invert concreting is under way, agitator trains run up a 145-ft. ramp on a 3-percent slope to the invert concreting bridge. Here, motors on the agitators are plugged into a power supply to discharge the concrete for gravity flow to the invert.

A 10-ft. long screed, drawn by an air-hoist, is used to shape the top surface of the invert. Wheels of the screed roll on the invert side forms, followed by a low-slung traveling platform on which the finishers work to complete the surface. Lag-threaded anchors are placed in the fresh concrete to hold the arch forms.

Arch concreting

Forms, form travelers, work platforms and concreting equipment are arranged so that concrete trains can move through the arch concrete placing operation if desired to make deliveries anywhere in the tunnel. Telescopic arch forms were constructed in 25-ft. units and a total of 300 lin. ft. of such forms are in use on the project.

Three or four of the 25-ft. units are normally placed at each concreting set-up, and concrete is placed at three locations simultaneously, but the entire 300 ft. of form can be used at one point if desired.

The arch forms, for 280 deg. of the

Blaw-Knox photo

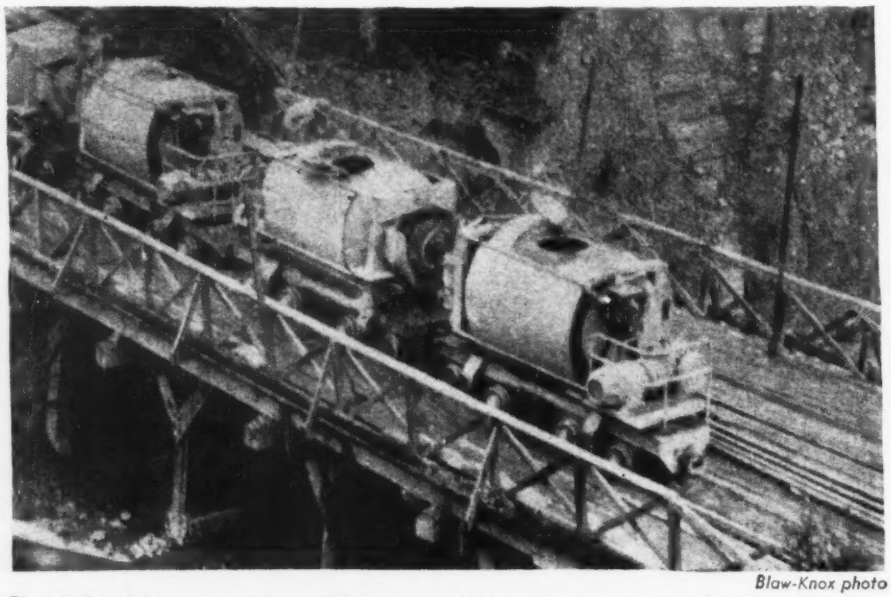
Fig. 4. The steel arch forms were built in three-hinged sections designed to telescope to move through the sections ahead.

circle are of the three-segment type with hinges connecting the segments at the upper 45 degree points on each side of the centerline. Specially designed steel clamps with lag-threaded 1¼-in. anchor bolts are used to hold the form to the invert concrete at the lower edge.

Arch forms are collapsed, moved and set by means of a form traveler that carries a 25-ft. unit at a time. The traveler has a wheel base of 30 ft. and operates on a set of rails placed at 7 ft. 6 in. centers, supported on steel brackets placed on the invert and held by the same anchor bolts that secure the bottom of the arch forms. The form traveler is propelled by an electric drive mounted on the traveler. Four heavy vertical hydraulic jacks are part of a centrally controlled and electrically operated hydraulic system for collapsing and expanding the telescopic forms. Four steamboat-ratchet jacks, in horizontal position, are used to assist in positioning and retracting the forms.

Concrete for the arches is mixed at a central plant above the adit and dropped through a pipe to charge the 5-cu.yd. agitator cars in the tunnel. Traveling "California switch" platforms of all-steel construction are located at strategic points to speed traffic by permitting trains to pass. Each such platform is 210 ft. long and has a 79-ft. traveling-ramp at each end with a maximum slope of 3 percent.

A 40-ft. traveling arch-concreting platform is located about 100 ft. in front of each set up of telescopic arch forms. Agitator cars are run up a ramp to arrive at the concreting platform where the agitators are energized to discharge their concrete into the boot-hopper of a 60-ft., inclined 30-in. belt conveyor. This raises the concrete to a 2-cu.yd. hopper directly above a 1-cu.yd. pneumatic concrete placer. Conveyor, hopper, placer and an air receiver for the placer are carried along with the concreting platform as it moves in step with concreting progress.



Blaw-Knox photo

Fig. 6. Electric-motor driven 174-cu. ft. agitator cars were used to transport concrete dropped into the tunnel from a plant on the surface.

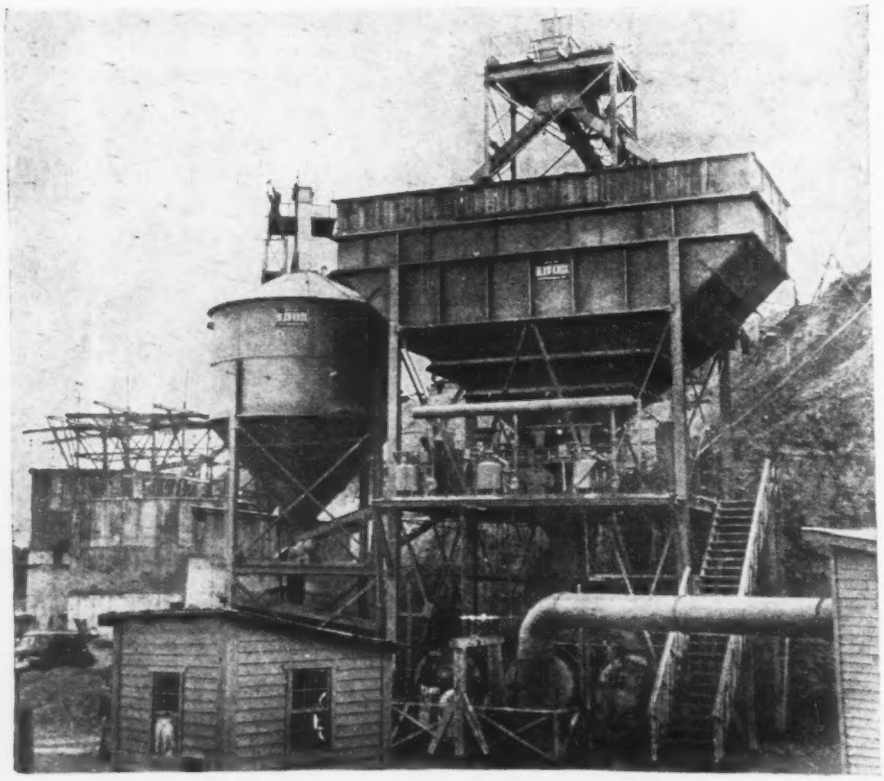


Fig. 5. A weighing batcher feeds each of three non-tilting mixers that dump concrete down a pipe to charge 5 cu. yd. agitator delivery cars inside the tunnel. Cement was stored in concrete tanks at left, which were built with slip-forms.

In each 25-ft. unit of arch forms there is a total of 15 hinged sections and access doors, each 18x24 in. Facilities also are provided in the forms for inserting and holding grout pipes at suitable locations. Two small travelers carry work platforms for access to the top doors of the form from which workers manipulate the 6 in. concreting pipe and take care of the necessary vibrating for consolidation.

The work is being done for the National Commission of Irrigation of Mexico. Marte R. Gomez is president of the commission and Orive Alba is executive commissioner. Renaldo Seluga is in charge for the government at the site, assisted by L. Silva.

Constructora Rosoff, S. A. was formed by Samuel R. Rosoff, New York contractor, primarily for this construction. M. L. MacLean is chief engineer; J. F. Holden is general superintendent, George Underwood is tunnel superintendent and H. E. Cronin resident engineer.

Chemical Treatment in Los Angeles Sewers

***Contents in Brief**—In urgent need of finding some means of reducing the bacterial count in sewage as a preliminary to ocean disposal, Los Angeles experimented with a chlorinated hydrocarbon for dosing sewers near the upper ends of long trunk lines. Used in combination with chlorine, this chemical has given such favorable indications that if further experience is confirmatory large savings in cost of chlorine treatment are expected.*

CONFRONTED with urgent necessity for immediately reducing beach pollution —a necessity made much more definite by a court order requiring that this be accomplished by June 1, 1946—Los Angeles has been carrying on experimental work under high pressure searching for quick results in reduction of bacterial population in sewage.

The long range plan for comprehensive sewage disposal facilities has been worked out in detail (*ENR* May 16, 1946, vol. p. 802) but results of that plan cannot be effective immediately and meantime "the most valuable and crowded recreational beaches of Santa Monica Bay" are quarantined by the State Board of Health. City officials believe that means of improving the situation have been found in the form of chemical dosing of the sewage at the upper ends of the sewer trunk lines. The latter, some of which range up to 50 mi. in length, serve the thickly populated area of Los Angeles and converge into the huge ocean outfall at Hyperion where peak flows are as high as 200 mgd.

After months of experiment and as of the dead-line date of June 1, more than 60 dosing stations were in operation and the number was expected to increase to about 100 by mid-summer. Officials of the Los Angeles Bureau of Maintenance and Sanitation are enthusiastic about results of the treatment used, which they say is not only satisfactorily reducing bacterial counts by the necessary amount but has already practically eliminated generation of hydrogen sulphide gas in the sewer trunks.

A summary of resultant data and conclusions, presented in a paper by Reuben F. Brown at the recent annual convention of the California Sewage Works Association, is abstracted in the following.

For some time prior to the start of this field experimental work the city's bureau of maintenance and sanitation had been getting excellent results in controlling odors and algae in some 350 mi. of ditches and open channels with a chlorinated hydrocarbon sold under the trade name of "Cloroben." Accordingly, early in the search for a bactericide to be used in a sewage dosing program tests were made with this product. When introduced in the lower reaches of long trunk sewers or wherever septicity was high, the results were not particularly encouraging. However, when introduced in the upper reaches of the system, where sewage is relatively fresh, there were some surprising results.

These were so encouraging that a widespread program of field tests was at once inaugurated. This involved setting up an extensive field organization. The objective was to provide means of determining conditions and changes in a system including 3,000 mi. of sewers serving an area of some 455 sq. mi. In addition to the city's own sewer system there are contributory discharges from sewer systems of nearby communities.

Field operating technique

Field operations were organized on the basis of a 7-day week with three shifts and continuous operation 24 hr. daily. Sewage samples taken at key points were immediately iced and rushed to the laboratory for analysis to provide accurate information on the effect of the various bactericidal expedients being tried.

Analyses of sewage in all trunk lines were made before and after treatment. Flow measurements determined high and low peak loads, and in industrial waste lines as well as in outside connections samples were taken to determine their effect on total sewage flow. Tests were made in accordance with standard methods of the American Public Health Association. Daily analysis of 50 to 70 samples became standard routine and more than 7,000 samples were analyzed in the first 4 mo. of this year.

Early in the studies it was realized that the chlorinated hydrocarbon did not act like chlorine and differed from it in fundamental characteristics. For example, chlorine is chemically an oxidizing agent and may be expected to be effective for 7 to 9 hr. In contrast with this, the chlorinated hydrocarbon is not an oxidizing agent, and has the great advantage that its effectiveness as a bactericide appears to continue for longer periods. However, it was found that success with this chemical depends upon handling it quite differently from chlorine.

Dispersion important

Thorough dispersal is important and to insure this a minimum dilution of 4 or 5 to 1 before application is used. The most effective combination for the heavy flows was found to be Cloroben in the proportion of 1 ppm. plus chlorine at the rate of a calculated 20 percent of the chlorine demand. With this treatment laboratory tests indicated that bacterial population could be reduced by about 99 percent. Field tests, thus far, are said to confirm these results.

At the Hyperion disposal plant samples of the sewage flow are taken, on an hourly schedule day and night, iced, and hurried to the laboratory for immediate analysis. A daily beach-sampling patrol of 22 locations is maintained to determine reduction of bacterial pollution in the ocean and certain members of the field personnel are assigned to studies of heavy flows of industrial wastes that interfere with the effectiveness of routine dosing procedure.

The most expedient dosing system was found to be with clean wooden barrels of 30- or 50-gal. capacity set in manholes and each provided with a spigot at the bottom of the barrel that

could be regulated to control the flow. On heavy industrial waste flow lines concrete tanks were used with capacities of 100 to 150 gal. On the main outfall, 30 mi. from the ocean, thousand-gallon tanks were used.

Adaptations of these dosages in neighboring contributory communities were made as required. For emergencies and shock loads of heavy industrial waste discharges emergency portable chlorination equipment is available. Los Angeles has three portable chlorination outfits with 24-hr. capacities of 6,000 lb., 300 lb. and 350 lb., respectively. These machines are mounted on trailers for convenient transportation to any point in the system. That shock loads of industrial waste are occasionally imposed on the system is shown by the fact that on one occasion 15 tons of slaughterhouse grease reached Hyperion at the rate of 11,000 ppm. from a 3-mgd. flow.

Prior to the present program of chemically dosing the sewer lines, some of the Los Angeles trunk sewers carried 5, 10 and 25 ppm. of hydrogen sulphide. Such quantities, of course, resulted in attacks on the structures and necessitated maintaining forced ventilation to reduce the extent of structural damage (*ENR* Jan. 11, 1945, vol. p. 67).

Since extensive use of the combined chemical treatment, heavy sewer gases have practically disappeared from the system and all forced ventilation has been discontinued. Continuous line tests using the Lamotte-Pomeroy indicator have shown only a trace to 0.8 ppm. of hydrogen sulphide and these field tests have been confirmed by laboratory analysis.

Over-all results

Based on reports of experimental work up to the early part of June, 1946, a summation of results attained with the chlorinated hydrocarbon product led city officials to the following conclusions: Bacterial population in sewage can be reduced 50 percent by the proper uniform distribution of this chemical through the entire flow, using a dosage of from 1 to 2 ppm. on different types of fresh sewage. This method of treatment does not require extensive equipment, the chemical is not dangerous to personnel nor is it difficult to handle.

Putrefaction and the formation of hydrogen sulphide is retarded, the sewage remains comparatively fresh and the chemical appears to dissolve or emulsify greases, thus destroying the gelatinous protective sheath around bacteria. It appeared that this might account for additional accelerated destruction of bacteria after contact of treated sewage with sea water. Another result of this emulsifying action is the removal of greases, slimes and bacterial growths that previously adhered to sides of the sewers. This highly desirable effect is expected to reduce greatly the cost of new construction by doing away with need for installing equipment to provide forced-draft ventilation.

Fundamentally, and most important of all, the conclusion reached by the bureau is that as the result of this chemical treatment the extreme ends of the quarantined zone on the bathing beaches are already protected from dangerous bacterial contamination. Accordingly, if the present favorable results continue, the use of this chemical plus emergency chlorination, particularly for industrial waste control, should save the city almost two-thirds of the expected costs of accomplishing the required bacterial reduction by chlorine dosage alone. City officials base this estimate on the expectation of a chlorine requirement at Hyperion of 18 to 20 tons per day at a daily cost of about $2,000. In contrast with this the cost of the 400-gal.-per-day chlorinated hydrocarbon dosage now employed is about $650 to $700.

Personnel

The investigation and experimental work has been done under the direction of H. P. Cortelyou, engineer-director, bureau of maintenance and sanitation, Los Angeles Department of Engineering. The field work has been under the supervision of Reuben F. Brown, superintendent of sewer maintenance and operation. A. A. Appel is assistant superintendent of sewer maintenance. Bacteriological laboratory control and analysis have been under T. A. Fitch, of the city's bureau of standards, assisted by John T. Young and Twiford Wilson.

Peacetime Training for Ex-Seabees Planned by Bureau of Yards and Docks

A training program for a peacetime volunteer organization of former Seabees and their Civil Engineer Corps officers has been planned by the Bureau of Yards and Docks in conjunction with the Bureau of Naval Personnel.

The organization, which will be open to inactive reserve members of the CEC and Seabee veterans only, is expected to provide the corps with a pool of competent practicing professional engineers, and of enlisted men competent in some division of the construction or related industries.

Available for quick mobilization in time of emergency, the organization will be large enough to meet all engineering and construction needs of the Navy not covered by the regular corps or other engineer specialists units.

Seminar courses will enable members to improve their technical ability and general knowledge of Navy needs and problems. Also, those who participate fully in the program will be available for immediate mobilization in an emergency, without further training. Veterans may, however, join on a partial participation basis if they desire. If, at a later date, the law permits, new enlistees also will be permitted to join.

Besides the seminar courses, which will consist of ten monthly meetings each, extension courses will be given on miscellaneous subjects. These will be optional to all members, except for the courses in Navy regulations and military law. Future training courses afloat, tours of naval shore establishments, and courses at command, staff and service schools are also considered.

The reserve component will be divided into geographical units, with fifteen members the minimum for a unit. Each area will be supervised by a Civil Engineer Corps officer who will be responsible to the district commandant for the operation, training and maintenance of the organization.

Any Seabee or Reserve Civil Engineer Corps officer desiring further information should contact the Director of Naval Reserves in his district, or Captain C. Ken Weidner, Room 2804, Arlington Annex, Washington 25, D. C.

Helping Cities to Help Themselves

New York State program of providing funds for local-works planning has stimulated 3,600 projects in 3½ years.

Joseph O. Heck
Director of Municipal Planning
Postwar Public Works Planning Commission
Albany, N. Y.

***Contents in Brief**—First of the states to extend aid for the promotion of public works planning, New York has stimulated its local communities to amass a backlog of $278 million of approved construction plans. Legislation for the establishment of a commission to direct this work and its manner of operation served as a pattern for similar activity in eight other states. On July 1 the commission terminated the receipt of further applications for state aid. The following is a brief account of experiences in a pioneer venture.*

PIONEER in providing financial aid for the promotion of local works-planning, New York State takes pardonable pride in accomplishments over the last three years. Not the least of these is the fact that 473 municipalities have matched dollar for dollar with the state in sharing the costs of public works plans to provide a balanced backlog of approved projects for future construction.

Because of the size of this backlog —some $778 million based on 1940 costs—applications for state aid were terminated on July 1. It seems opportune, therefore, to review briefly what has taken place and indicate what has been learned from this new experience in state-local government relationships during the 3-yr. period.

Participation of the state in advance planning had its origin in 1942 when the legislature created the Temporary Postwar Public Works Planning Commission, which was concerned primarily with state projects. The functions of the commission were expanded in 1943 to grant financial aid for the planning of municipal projects (*ENR* April 8, 1943, vol. p. 496).

Planning concepts in the United States were fairly well established when the war broke out, but there was little practical accomplishment on the local level. And no state had ever attempted the assistance to municipal planning activities that Gov. Thomas E. Dewey and the New York legislature called for in the precedent-making legislation.

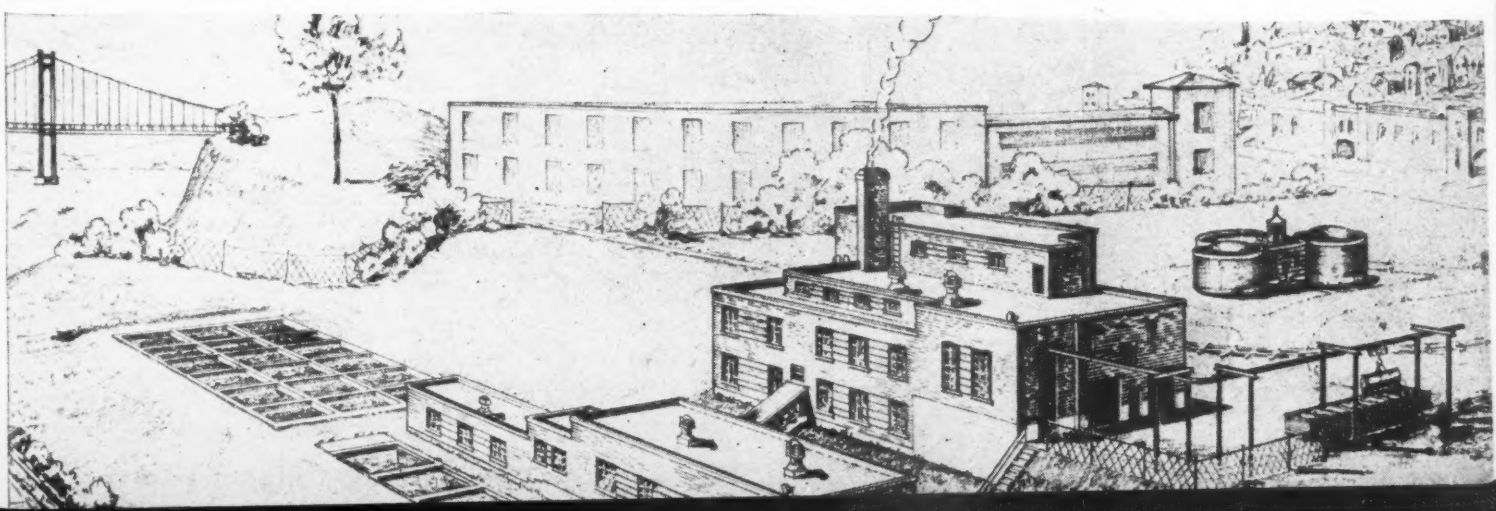
It will be recalled that during the depression years the federal government made grants of funds for various kinds of local public works. And at the present time the Federal Works Agency makes grants of funds for planning. But no state had ever before sought to stimulate planning on a local level such as was envisaged in the New York program.

Under the New York law, the planning commission was empowered to make a grant of up to one-half of the planning costs after a project had been approved by the commission. Close liaison is maintained with FWA, and before action is taken all projects and applications for grants of federal funds are checked by that agency with the commission.

Action by other states was stimulated by New York's law. They waited a year and watched its operation. Then in March, 1944, Michigan became the first of eight states to adopt similar laws all aimed, like New York's, toward making state and local public construction an orderly process based on need and ability to pay.

In addition to Michigan, postwar

Fig. 1. Sewage disposal project plans for municipalities totalling more than $88 million are underway in New York state. This sketch shows how the treatment plant to be built in Poughkeepsie will look when construction is completed.



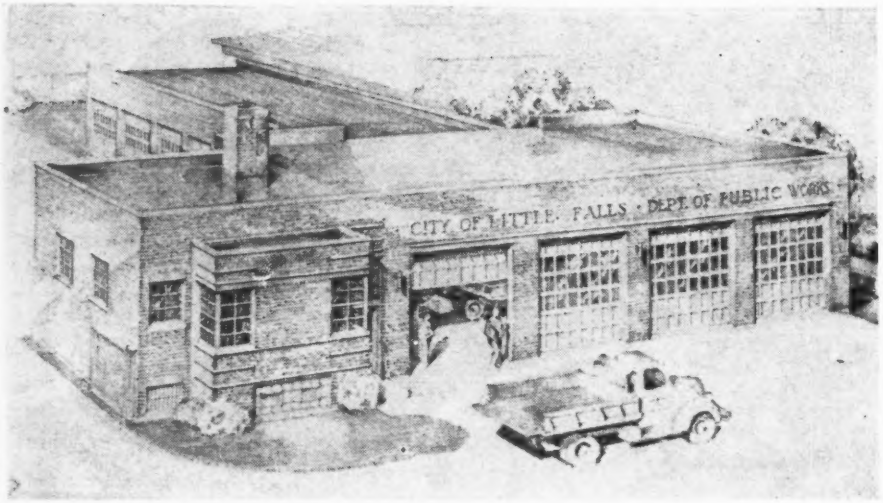


Fig. 2. Planning of public works of all types was aided by state participation. A central municipal garage for Little Falls is one of the projects for which designs were completed in anticipation of early bid requests.

planning laws were passed by Maryland, New Jersey, California, Pennsylvania, Illinois, Indiana and Washington. Indiana's laws required that funds "loaned" for planning costs must be repaid to the state treasury within five years, while Washington has provided its state development board with $20,000,000 to spend equally on construction of state and municipal improvement projects.

Local interest stimulated

When the municipal program was launched in New York in January, 1943, interest among local officials was high. Many thought the new law would open the door to outright grants of state funds. They saw an easy way of obtaining that sorely-needed sewage disposal plant, replacing that obsolete school building, erecting various municipal structures—without spending local tax funds.

Actually, only one-half of planning costs of municipal projects could be allowed by the commission, and there was no intention of pouring state funds into the construction of local projects.

This policy tied in with other state policies, for, seeing fruitful tax years resulting from war-swollen private and industrial incomes, State Comptroller Frank C. Moore, a member of the commission, was recommending reduction of local bonded debts and other measures designed to put municipalities on a sound financial basis—in other words, to pay off their debts and prepare for a possible postwar depression with an inevitable increased demand for relief funds.

Difficulties in obtaining materials and labor for public buildings or expansion of facilities helped to make the commission program attractive to municipal officials. Those who early began looking ahead to a postwar world were quick to realize the advantages obtainable from the state plan, aside from the financial help involved.

Smaller communities, for instance, cannot afford to retain the professional services that are available on the staffs of the larger city and state departments. In other municipalities overburdened engineers or architects could not take on the added chore of planning for some future project. Here the financial aid from the state was a prime factor in initiating projects. Then, too, the expert assistance and advice of heads of the several state departments was made available without cost, a condition that has served to break down, in New York State, some of the barriers that long have existed between officials on different levels of government.

Curtailment of program

Recently the commission announced that no further applications for state funds for planning of municipal projects would be accepted after July 1, 1946. It was an action made necessary by the response since January, 1943, to the commission's program.

As of July 1 this year the commission had approved 3,178 projects sponsored by the municipalities, calling for an estimated $277,858,630 worth of building. Nearly $5,000,000 in state-aid funds had been allocated toward planning costs—an average of about $1,600 a project. The municipalities matched this expenditure to pay their share of costs.

An additional 569 projects, calling for an estimated $86,099,831 worth of building, are awaiting action by the commission or the State Department of Public Works.

All this adds up to 3,747 projects approved or awaiting approval, which call for $363,958,461 worth of construction on the basis of 1940 costs.

The municipalities can honestly claim the credit for this program. Their

TABLE I—NEW YORK STATE MUNICIPAL PROGRAM BY TYPE OF PROJECT
(Figures in Parenthesis Indicate Number of Projects as of July 15, 1946)

	Contracts Outstanding	Plans Under Way	Plans Complete	Total
Bridges	.....	$3,788,782 (85)	$5,487,376 (153)	$9,276,158 (238)
Heavy Construction	.....	4,247,640 (21)	879,348 (9)	5,126,988 (30)
Sidewalks	.....	572,295 (33)	401,568 (9)	973,863 (42)
Parks and Playgrounds	$50,000 (1)	5,890,177 (65)	4,580,200 (55)	10,520,377 (121)
Miscellaneous	94,800 (1)	8,415,641 (127)	2,841,008 (35)	11,351,449 (163)
Roads	.....	38,146,741 (767)	35,955,328 (495)	74,102,069 (1262)
Sanitary	5,353,620 (15)	59,480,126 (392)	23,181,001 (327)	88,014,747 (734)
Water Supply	240,400 (5)	10,083,502 (75)	5,185,186 (69)	15,509,088 (149)
Buildings	4,767,260 (26)	38,394,113 (225)	13,785,707 (127)	56,947,080 (378)
Airports	500,000 (1)	4,438,800 (5)	44,385 (1)	4,983,185 (7)
Total	$11,006,080 (49)	$173,457,817 (1795)	$92,341,107 (1280)	$276,805,004 (3124)

officials and their citizens have never been under compulsion by the state administration to participate in any program of postwar planning. The projects they have proposed have been of their own devising, arising from their estimates of community needs.

No high-pressure sales

No high-pressure attempts were made to have any municipality plan a postwar program of public works. At first three, but in the past year, two field representatives have been busy answering calls for information about the commission program, furnishing assistance in mapping a plan of local operations or assisting in the preparation of reports and other data required by the commission. In every case, however, a municipal project is the result of local initiative and endeavor. The state participated only after local officials and taxpayers had thought about and talked over the feasibility of a proposed project.

When municipal officials came before the commission, they were prepared to talk business. They knew what they wanted and were prepared to go ahead with planning. The commission's first job was the examination of a careful and thorough analysis of the sponsoring community's finances prepared by the comptroller's staff. Taking into consideration bonded debt, annual tax receipts, population trends, and other factors, the commission looked at the proposal with the questioning eye of a local taxpayer, and if it could not reasonably assure itself that the local financial set-up was sound then the vote was "no." The number of approved projects and the number of sponsoring communities submitting them indicate that the financial picture in most of New York's municipalities is a good one.

Project must be needed

Second in importance to financing was consideration of the need for a particular project. There is little to be gained by sanctioning a construction program for which there is no apparent immediate postwar need or simply to enable a municipality to boast of its postwar projects. The commission's function was to encourage local planning where it was felt that depression and war had made new construction or expanded services necessary in the postwar period. Other projects received little consideration no matter how excellent a community's finances.

A simple system of priorities was set up by the commission after the municipal program was started, so that it and the community could schedule postwar building on the basis of need.

Another system of checking was also devised, so that construction of municipal projects can be carried through without delay once actual building is ready to start. This policy required checking of all plans by various state departments under whose supervision such work is performed. Thus the plans for new schools are first checked for approval by the state education department; sewer, water and hospital jobs are first scrutinized by the health department; jails by the correction department; county homes by the social welfare department; and municipal airports by the commerce department's bureau of aviation.

TABLE II—APPROVED PROJECTS CLASSIFIED BY SIZE

	No. of Projects	Est. Const. Cost
Under $49,900	2,109	$46,665,323
50,000–99,900	582	36,916,819
100,000–249,900	473	82,825,039
250,000–499,900	87	31,738,761
500,000–1,000,000	44	28,496,439
Over 1,000,000	29	50,162,623
Total	3,124	$276,805,004

Improvements in procedure

Policies laid down by the commission when the municipal program was launched have been retained substantially unchanged. One important change that was incorporated in the original law by the state legislature now permits the commission to allocate funds where a special district (water, sewer, school, etc.) is to be created and mapped. Prior to passage of that amendment no funds could be granted where a subdivision had not yet come into existence, although the preparation of maps is a necessary preliminary to the establishment of a special district in New York state. The amendment has been successful in encouraging basic planning of sewer and water lines especially.

One other change in policy established the requirement that the municipality purchase or obtain a long-term option on the site where the proposed public work is to be carried out. Previously, allocations were voted before site decisions were made in the hope that land acquisition would be speeded. When this liberal policy did not produce desired results, the change was ordered.

Surprisingly few snags developed as the municipal program increased in size. The detailed analysis given each project was of considerable help. It has happened that proposed projects which were regarded sound at first glance later had to be discarded when study revealed faults in proposed construction or in financing. Most of the municipal projects that failed to pass the analysis were withdrawn voluntarily by local officials for further study and re-submission, or for preparation of a completely new project.

During the war, while the state's finances were being put in order, municipalities were encouraged to improve their own financial standing. Permission to refund bonds was denied where state fiscal authorities were convinced that a little local thrift and planning

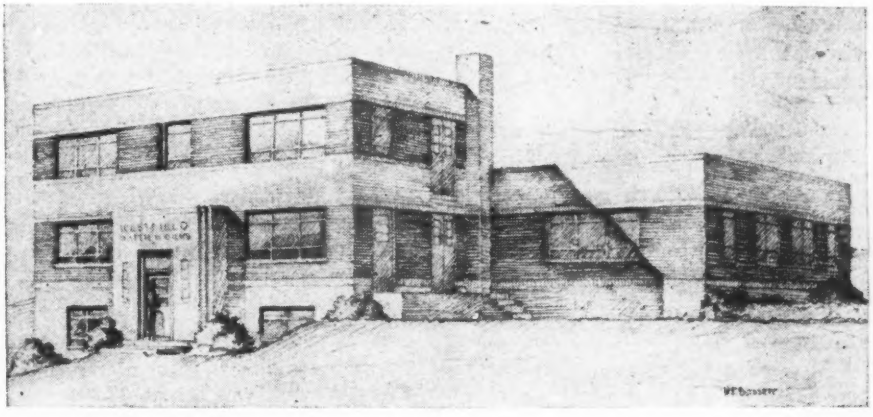


Fig. 3. At Westfield, this water treatment plant will be built. Altogether, plans for 149 water supply projects totalling over $15 million have been approved.

would effect a longer range improvement. An improved system of sharing state-collected taxes with the municipalities has been voted by the legislature. In the communities for which projects were approved, a close watch was kept on planning details where local officials were unable to do so.

Consequently, most of the communities in the state with postwar construction scheduled have proper plans prepared or in process of preparation and are in shape financially to start work if the need arises.

Construction costs and progress

In both the state and municipal programs estimates of cost of projects are based on 1940 figures. It is admitted that current construction cost figures are far in excess of the 1940 level, which was selected as the mean between the depression lows and the wartime peak. What construction costs will be when the building program is finally started in New York is an unknown factor, of course.

Governor Dewey has laid down a definite policy that only the most urgent of state projects are to be started this year. Consequently the bulk of the state departmental construction program, which will probably aggregate $200,000,000, is deferred until demands of private industry are satisfied to a considerable extent and until the labor and material markets are able to supply their products more plentifully. This same policy is being urged on the municipalities because their completed plans will be equally good one, two or three years from now. And if an emergency arises, the plans can be put to immediate execution to provide employment on the construction jobs and in allied industries.

John E. Burton, director of the state budget, is chairman of the New York State Postwar Public Works Planning Commission, whose membership, by law, must include not less than three members of the legislature.

In addition to Mr. Burton and Comptroller Frank C. Moore, the other members are Martin P. Catherwood, commissioner of commerce; Charles D. Breitel, counsel to the governor; Senator Arthur H. Wicks, chairman of the Senate Finance Committee; Assemblyman Julius J. Gans, and Assemblyman D. Mallory Stephens, chairman of the Ways and Means Committee of the State Assembly.

Ross E. Sluyter is director of state planning (i.e., planning projects for the several state departments) while Miss Dorothy E. Buckbee, as assistant to the chairman, heads up the administrative phase of the commission's work.

Mosquito Abatement by Flood Control Is Effectively Practiced in California

Mosquito control by flooding, spreading oil, and then releasing the water, is used in certain parts of the Matedero Mosquito Abatement District in Santa Clara County, California. In this way, effective control is attained and the individual spraying of many small pools of water is not required.

The Matedero Mosquito Abatement District, which serves an area of 74 sq. mi. with a population of some 32,000, abuts on the west side of San Francisco Bay some 30 mi. south of San Francisco. The area in which flood control abatement is used is marshy land in the delta region of Stevens and Permanente creeks, which have a watershed of some 53 sq. mi. of valley and mountain land.

Flood waters diverted

To effect this mosquito control the flow in these two creeks at peak stages is controlled by diverting water into salt marshes surrounded by dikes. The depth of water, which is carefully controlled by gates, is allowed to become just great enough to float a flat-bottom boat. If the water is allowed to become too deep adjoining properties may become endangered. The amount of water stored for this operation varies according to the rainfall but averages between 700 and 1,000 acre-ft. each year.

Mosquito larvae are most easily killed by an oil film just after they are hatched. In the Matedero district the flood waters are retained until this period is reached and then a light film of diesel oil is spread over the flooded area from a flat-bottom boat. No special spreading equipment is required. The water is then released and flows down to tidal areas. Water left in sink holes is larvae-free.

Where a light oil such as diesel oil is used, the film disintegrates within a few hours. Although effectively killing the mosquito larvae, the oil does little injury to vegetable, fish or game life. The result is only a slightly burned line or fringe on the marsh vegetation after the water is drained off.

In years when rainfall is low and enough water cannot be diverted at peak flow periods to spread oil from a boat, some form of spraying method of abatement is required. In one such method developed in this district the spraying is done with a power sprayer set in a flat-bottom boat, which uses the available sloughs for approach. Several hundred feet of hose are attached so that a fairly large area can be serviced.

On marsh areas that cannot be reached by either of the above methods, hand spraying is used. However, experience has proved that this method is more expensive and provides less effective control than either power spraying or flooding.

Cost figures favor flooding

Figures for this district show that the cost of flood control abatement is about $1 per acre, mosquito control by power spraying from a boat costs from $2.50 to $3.12 per acre, and hand spraying costs a minimum of $5.40 per acre.

Oil consumption for the three methods are as follows: flood control—about 3.2 gal. per acre, power spraying from a boat—22 gal. per acre minimum, and hand spraying—32 gal. per acre minimum.

District officials are enthusiastic over the success of the flooding method, which can be used at this location because of suitable conditions. They point out, however, that its feasibility in other locations perhaps may be questionable.

The flooding method was based on an idea of Donald Steel, chairman of the board of trustees of the Matedero Mosquito Abatement District. Gordon W. Mapes is superintendent of the district and the abatement work by this method has been under his direction.

Break-Point Chlorination Increases Manganese Removal in Sand Filters

J. E. Edwards and G. B. McCall

Assistant Superintendent and Junior Chemist, respectively,
Montebello Filters, Bureau of Water Supply, Baltimore, Md.

***Contents in Brief**—Use of sand filters as a contact bed following break-point chlorination effectively removed excessive manganese from raw water at Baltimore's Montebello filtration plant. Other advantages included decreased bacterial count, fewer taste complaints and 22-percent cost savings over methods previously used.*

ORIGINALLY tried at Baltimore's Montebello filtration plant as a substitute method for manganese removal when shipments of the chemicals normally used became unsatisfactory, break-point chlorination has proved successful in eliminating the manganese, improving the bacteriological record and reducing taste complaints. In accomplishing these results a saving of some 22 percent in the cost of chemicals was realized.

The presence of excessive manganese in raw water entering the Montebello plant is a seasonal condition occurring from July through October. Usually this condition had been met by substituting ferrous sulphate and lime as coagulants in place of the alum normally used, this change in chemicals raising the pH of the coagulated water to a value of 9.0. Because of inability to obtain satisfactory shipments of ferrous sulphate in 1943, it became imperative to find another method of manganese removal so that the quality of water delivered to the consumer would be unimpaired.

Based on small-quantity removal

This problem of manganese removal had been recognized elsewhere, but chlorination, aeration, and special contact beds were used prior to filtration. However, although no aeration or contact beds were available at Montebello, it was assumed that manganese could be removed by using chlorine as an oxidizing agent and the rapid sand filters as a contact bed. This assumption was based on experience in removing a small quantity of manganese from the water in the winter of 1944.

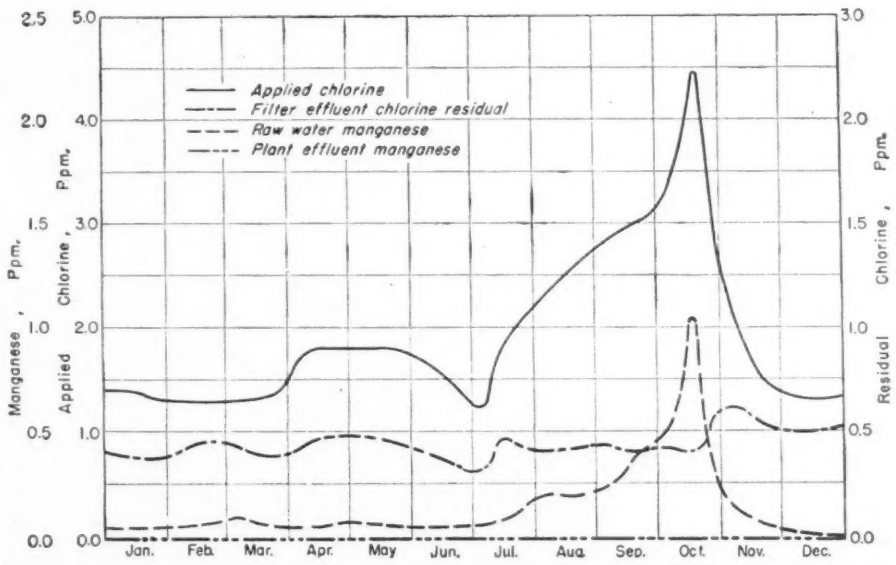


Fig. 1. Manganese-free water was delivered to Baltimore consumers during the year 1945 by using break-point chlorination during the critical July-October period.

During January 1944, the daily average applied chlorine dose was 1.57 ppm.; residual chlorine at the filter effluent was 0.31 ppm. In order to conserve chlorine, the applied dose was reduced to 0.94 ppm. in February and 0.78 ppm. in March. Although the indicated chlorine residual at the filter effluent for February and March corresponded to that for January, reduction of the chlorine dose below 1.00 ppm. caused manganese, which was present in the raw water, to appear in the filtered water to the extent of 0.10 ppm. Further tests showed the residual to be 0.05 ppm. free chlorine and 0.25 ppm. chloramines and indicated that an increase in applied chlorine was necessary to obtain a true free chlorine residual.

Application of chlorine, therefore, was increased gradually from 0.8 ppm. to 1.8 ppm. Indications that the break-point had been reached were confirmed by the presence of 0.30 ppm. free chlorine and only 0.04 ppm. chloramines. This increase in free chlorine residual was accompanied by complete elimination of the manganese from the filtered water, a condition that made it seem logical that the larger amounts encountered during August, September and October each year could also be eliminated.

More chlorination capacity needed

Manganese in the raw water began to increase on July 10, 1944, and continued to increase until Oct. 21, at which time a maximum of 1.75 ppm. was recorded. To control this in-

crease, chlorine was applied to maintain a residual between 0.4 and 0.5 ppm. in the filter effluent. On Sept. 27, the chlorine residual in the effluent dropped below 0.4 ppm. and by Oct. 13 reached 0.19 ppm., even though the applied chlorine was 2.6 ppm. The effect of the low chlorine residual was to increase the manganese in the filtered water from 0 ppm. to 0.15 ppm. It was impossible to apply more chlorine because the limit of chlorinator capacity had been reached and, furthermore, chlorine shipments were delayed.

During the next 23 days, the critical manganese period, it was necessary to return to the ferrous sulphate and lime treatment. Chlorine was applied at the rate of 2.25 ppm.; chlorine residual at the filter effluent was 0.45 ppm. Of this, 0.10 ppm. was free chlorine and 0.35 ppm. was chloramines. Because of this change in ratio of free chlorine to chloramines during the critical manganese period, objectionable tastes were present due to algae, a condition corrected by the use of activated carbon. Manganese in the raw water decreased to 0.01 ppm. by Nov. 10, at which time the ferrous sulphate and lime treatment was terminated and the alum treatment resumed.

This experience of 1944 definitely proved the assumption that the manganese could be removed if sufficient chlorine were applied. It was decided, therefore, to continue the experiment during 1945.

As in previous years, the manganese in the raw water began to increase July 10, continuing until a maximum of 1.05 ppm. was reached on Oct. 20. In addition to the regular chlorine equipment, three supplementary units —two of 2,000 lb. per day and one of 5,000 lb. per day capacity—enabled application of 4.5 ppm. This was sufficient to maintain a true chlorine residual of 0.4 ppm. at the filter effluent, and to give the consumer manganese-free water for the entire year. The chlorine-manganese relation for 1945 is shown in Fig. 1.

Catalysis helps removal in filter

Tests of the effluents from the settling basin, the filters, and the clear water reservoir to ascertain the reduction of manganese through the plant showed that, in 1945, 25 percent raw water manganese removal occurred in the mixing and settling basins and 75 percent in the sand filters. Some of the removal was due to the catalysis caused by the manganese-coated sand grains.

To prove that catalysis was responsible for some of the manganese removal an experiment was performed by filling a glass tube 6 ft. long and 2½ in. in diameter with 6 in. of gravel and 18 in. of manganese-coated sand from a plant filter. Untreated raw water containing 0.5 ppm. manganese was run through this filter at a rate of 2 gpm. per sq. ft. This test showed complete removal of the raw water manganese for 24 to 36 hr., after which time manganese was present in the effluent. This demonstrated that catalytic action of the sand had ceased.

The filter was then dosed with a strong chlorine solution and thoroughly washed with tap water. Raw water was again run through the filter, the effluent being free of manganese for another 24 to 36 hr. The chlorine apparently reactivated the sand so that catalysis could be resumed.

TABLE I—REDUCTION OF TASTE COMPLAINTS WITH INCREASED CHLORINE RESIDUALS

Year	No. of Taste Complaints	Aver. Chlorine Residual, ppm.
1940.....	516	0.17
1941.....	133	0.19
1942.....	60	0.22
1943.....	28	0.26
1944.....	30	0.36
1945.....	0	0.37

Accompanying the manganese removal by break-point chlorination was a marked decrease in bacteria count and a decline in taste complaints, although the bacteriological record of the raw water showed a poorer quality for 1945 than for 1940. Use of chlorine residual above 0.25 ppm. previously had been considered unwise because of objectionable taste, a fact disproved at the Montebello filters by use of chlorine residuals as high as 0.60 ppm. without any complaints from consumers. The increase in average chlorine residual from 0.17 ppm. in 1940 to 0.37 ppm. in 1945 decreased correspondingly the complaints of objectionable tastes, as indicated in Table I.

Chemical costs are lower

The economics of removal of manganese from the raw water by break-point chlorination was also considered, the cost of chemicals used in September and October, 1939, being compared with chemical costs for the same months of 1945. As stated above, manganese removal at the Montebello plant was formerly accomplished by the use of ferrous sulphate and lime. Furthermore, since September and October are the months of excessive manganese occurrence, it was decided that a better cost comparison could be made by using these months as a basis.

It was found that coagulation costs were comparable for either alum or ferrous sulphate and lime when local prices for these chemicals were used. The difference in the cost of the two methods lay in the fact that activated carbon was necessary with the ferrous sulphate and lime treatment, but not with the break-point chlorination. As shown in Table II, an average of 6.51 lb. of chlorine and 16.64 lb. of activated carbon per mg. was used in 1939, while 26.60 lb. of chlorine per mg. was used in 1945. No activated carbon was used in the latter year.

Using a price of 4c. per pound for carbon and 2.4c. per pound for chlorine made the cost of chemicals 82c. per mg. for 1939, and 64c. per mg. for 1945. This was a difference of 18c. per mg., a saving of 22 percent by using the break-point chlorination method for manganese removal.

TABLE II—CHEMICALS USED IN REMOVING MANGANESE AT MONTEBELLO BY FERROUS SULPHATE-LIME AND BY BREAK-POINT CHLORINATION

Month	Raw Water Manganese, ppm.		Pounds Per Million Gallons									
			Alum		Ferrous Sulphate		Lime		Chlorine		Carbon	
	1939	1945	1939	1945	1939	1945	1939	1945	1939	1945	1939	1945
Sept.	0.26 to 0.67	0.22 to 0.45	0	6.34	9.67	0	9.26	4.50	6.17	24.60	14.93	0
Oct.	0.28 to 1.05	0.23 to 1.05	0	6.26	10.67	0	9.17	5.34	6.84	28.60	18.35	0
Average	...	...	0	6.30	10.17	0	9.22	4.92	6.51	26.60	16.64	0

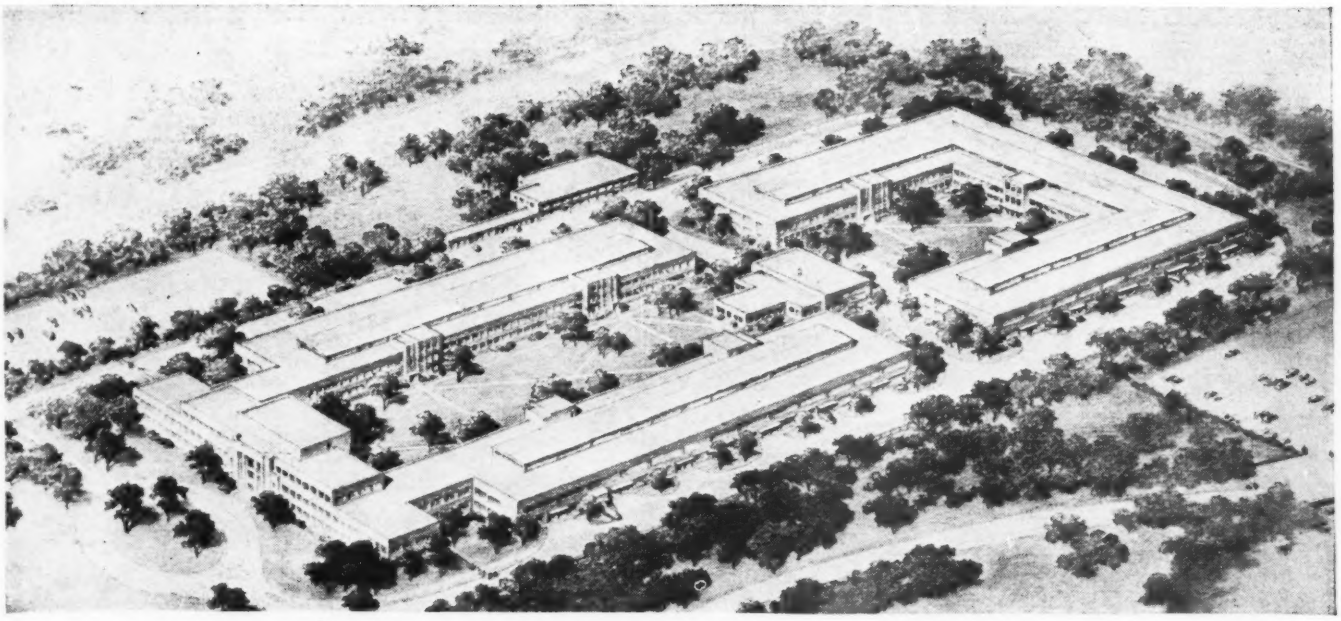


Fig. 1. Laboratories of new research center face interior park; loading is provided for along exterior walls.

Building Materials Research Laboratory Features Novel Movable Partitions

Contents in Brief—*First of six structures planned by the Johns-Manville Corp. for research on building materials is a factory-laboratory to contain facilities for small-scale factory operations and pilot-plant testing of wet processes. The laboratory portion has been laid out on a modular basis so that movable interior walls can be used to section off working areas as needed, and for convenience, service outlets have been incorporated in these partitions. In addition, a removable exterior rear wall permits extension of the pilot-plant area.*

FLEXIBILITY in utilization of space was a major consideration in the design of the new Johns-Manville Research Center, the first building of which is now under construction near Manville, N. J. In this structure, which contains ten factory-laboratories, movable asbestos-cement faced partitions with enclosed service outlets are to be used to divide the laboratory area as needs require. Plans also call for use of asbestos-cement exterior rear walls that are removable to permit extension.

Estimated to cost about $2,200,000, the initial building (right-hand leg of the larger U-shaped building, Fig. 1) will be devoted to "wet semi-works," that is, to small-scale factory and pilot-plant testing laboratories dealing with wet or soupy processes. Ultimately, all the structures shown in Fig. 1 will be built—all devoted to building materials and industrial products development—including the main research laboratory and administration building (lower left), containing service laboratories for materials testing; "dry semi-works" laboratories far side of the larger U-shaped building; an engineering and machine shop building (center), providing facilities for designing of new processing machinery for the semi-works laboratories; a water filtration and waste processing plant; and store rooms and garage. The U-shaped structure (upper right) will double the capacity of the research center.

Providing 337,000 sq. ft. of floor area, the buildings will be grouped around a quadrangular park on a 93-acre plot near Bound Brook, N. J., and across the Raritan River from a Johns-Manville plant at Manville. A trucking tunnel connects the new structures.

Location of the research center away from the nearby factory was deemed desirable because of the difference in types of employees engaged at each establishment. In fact, this consideration affected the layout of the buildings and landscaping. For example, windows of the laboratories present a view of the interior park, rather than of the parking areas and railroad siding.

Factory tests run near labs

The architecture of the buildings is purely functional, with an effort being made to obtain beauty by simplicity. Salmon-colored brick is to be used for exteriors facing the park, whereas corrugated asbestos-cement, easily removable to enable future extensions, is used for elevations facing the river and the railroad. The wet semi-works building is characterized by lack of decorative detail, continuous rows of steel-sash windows, and flat roofs of corrugated asbestos-cement with insulating-board under built-up roofing.

Of steel-frame construction, 134 ft.

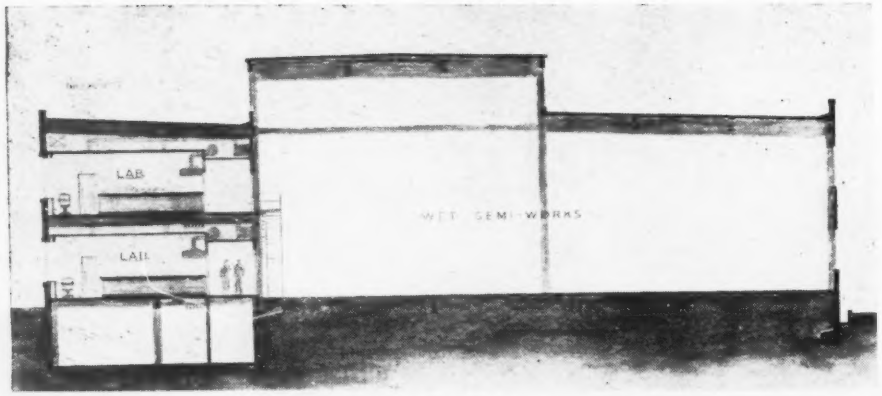


Fig. 2. Section through factory-laboratory building shows the 100-ft. wide area devoted to factory testing involving soupy materials, the control laboratories, the tunnel connecting the center's six buildings, and the glass-enclosed promenades.

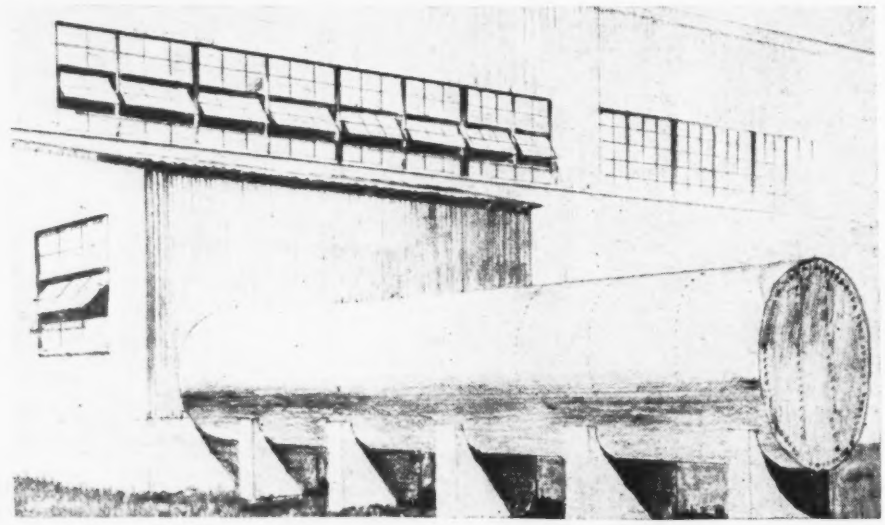
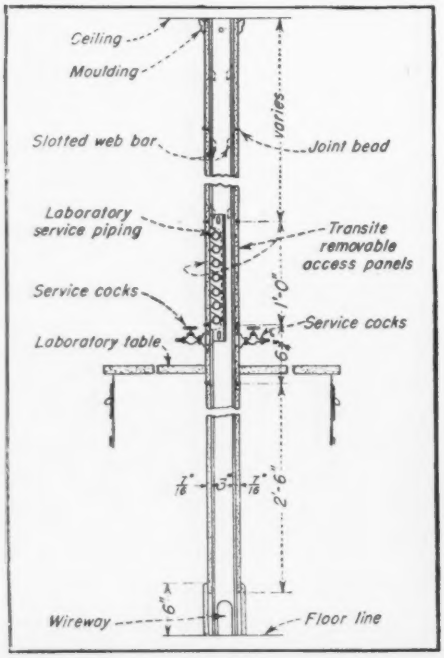


Fig. 3. Extension of semi-works is "buttoned on" after removal of exterior siding.

wide and 572 ft. long, the building is separated into two areas by a glass-enclosed promenade. On one side are the laboratories, laid out in modules of 11x26 ft., and on the other side are experimental factories covering a 100-ft. wide area for the full length of the building (Fig. 2). Thus, this research center will differ from many other industrial research laboratories that are supplemented by product development and semi-work facilities located elsewhere. The installation of experimental manufacturing research work adjacent to related laboratories is desirable because the durable properties of such products as asbestos shingles, asbestos wallboard and asbestos-cement pipe depend as much upon how the ingredients are put together mechanically as they do upon the ingredients themselves.

Each of the combination laboratory and experimental factory units in the new building will be staffed by a worker-scientist team, whose mission will be to solve some special building materials or industrial products development problem. Floor space will be apportioned to the teams as needed. In the laboratory area, which occupies two 10-ft. 6-in. clear height stories, as contrasted to the one-story semi-works area, space will be assigned on a modular basis. The 11x26-ft. modules were chosen as having the most economical, efficient functional dimensions for a



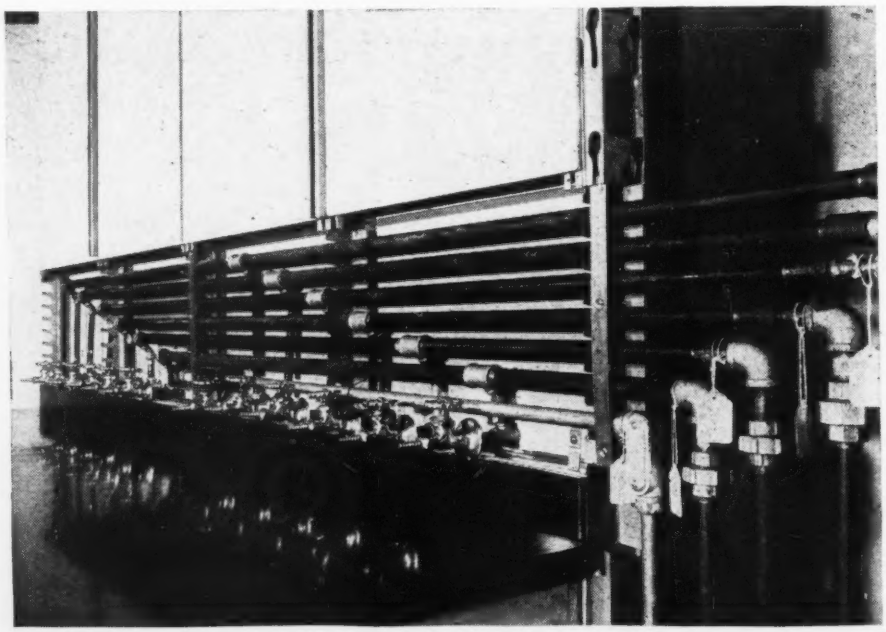


Fig. 4. Movable partitions utilize special steel studs notched for carrying service piping, for buttoning on asbestos-cement panels and for supporting wall brackets. A wireway is provided at the base of the wall.

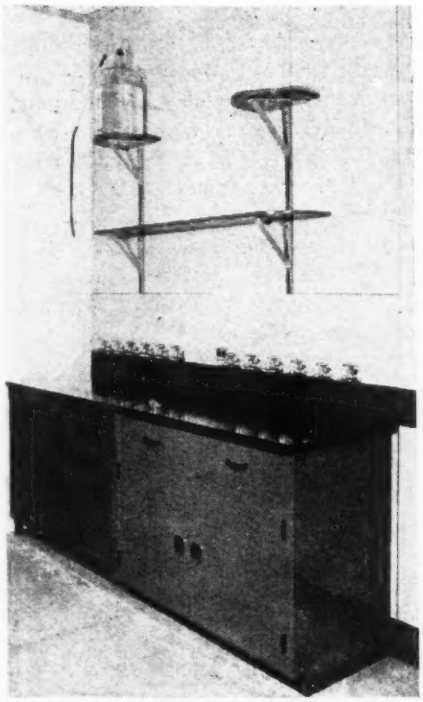


Fig. 5. Asbestos-cement sheets conceal service pipes in the movable partitions. If benches are placed against the wall on both sides, two laboratories can be serviced from the same pipes.

technical man and his assistant. Thus, the width of a room will always be some multiple of 11 ft.

Defined by movable partitions, each laboratory will have one window and two rows of recessed fluorescent lighting fixtures per module. Except in very special cases, partitions will not be used to apportion space in the semi-works area.

Floors are to be asphalt tile on concrete, and the hung ceiling, concealing utilities and air ducts, is to be faced with acoustic tile. All laboratory spaces will be air-conditioned, whereas testing space will be air-conditioned and humidified.

Pipes concealed in partitions

The movable interior walls, while designed especially for this research center, introduce a new method of industrial laboratory construction that the company expects to offer as part of its service to other industries. These partitions (Fig. 4) consist of $\frac{7}{16}$-in. thick, flat asbestos-cement panels that button into notches in special steel studs, spaced at 2-ft. intervals, with provision for carrying completely concealed service piping (Fig. 5). The notches are wider at the top than at the bottom so that to remove a panel it is necessary merely to raise the sheet and pull it away from the studs. Other notches are provided to support wall brackets.

Utilities for servicing the laboratories run the full length of the building under the floors, and at 11-ft. intervals, where partitions may be located, provision is made for tapping into them. As shown in Fig. 4 (left), the service outlets in the movable walls can supply two laboratories.

Removable exterior wall

Openings are provided in the rear wall for delivery and removal of materials. Truck trailers can be buttoned on adjacent to the doorways and left in place temporarily for storage of raw materials and refuse, thus providing a saving in permanent construction of storage space.

Plans for the research center were prepared by Shreve, Lamb and Harmon, architects. Turner Construction Co. is erecting the wet semi-works and laboratory building. D. Wentworth Wright is architectural consultant for Johns-Manville-Research-Development. Purdy and Henderson are the consulting structural engineers, Clark, Rapiano and Holleran, landscape architects, and Syska and Hennessey, consulting mechanical engineers.

Utilities and Installed Equipment For the Johns-Manville Research Center

Water Purification

Plant—Two-story brick, steel-frame structure, 42x68 ft. inside; three concrete rapid sand filters, 15x17 by 9 ft. deep, designed to operate at 2 gpm. per sq. ft.; 190,000-gal. clear well.

Treatment—Process water from Raritan River pumped at maximum rate of 1,500 gpm. through traveling screen to two low-service, vertical centrifugal pumps, discharging to primary chamber of a mechanical mixing and flocculation unit, where alum and soda ash are added; clarification, rapid filtration and chlorination follow.

Waste Water Treatment

Plant—Bar screen, chemical mixing chamber, flocculation basin, settling tank, and sludge pump and vacuum filters; capacity, 1,400 gpm. average producing one ton of dry sludge per day.

Treatment—Primary treatment only, including screening, flocculation with alum, and sedimentation; outfall to river; sludge vacuum filtered and cake trucked to disposal grounds.

Power and Lighting

Supply—Aerial feeder brings in 26,000 v., which is stepped down to 4,160 v. for distribution; power systems in buildings operate at 440 v., 3-phase, while lighting is designed for 3-phase, 4-wire, 120-208-v. system; laboratory power distribution system consists of 120- and 440-v. floor junction boxes containing circuits that are extended through the movable partitions; transformers in building basement are of non-inflammable oil type.

Lighting—Intensity of 40 foot-candles specified for laboratories, about 15 foot-candles for corridors and about 30-foot candles for wet semi-works; recessed fluorescent fixtures with prismatic lenses used in laboratories and corridors; incandescent lighting in utility spaces and wet semi-works.

Heating and Air Conditioning

Steam Supply—Main header in steam room distributes to semi-works equipment at 150 psi., to semi-works heating system at 40 psi., to laboratory hoods and heating stack at 15 psi. and to the direct heating system at 5 psi.

Heating—Copper convectors in laboratory, centrally controlled from a compensated outdoor thermostat; unit heaters in semi-works area: propeller type heater in skylight to prevent excessive down-drafts and suspended revolving type controlled by thermostat in working area.

Air Conditioning—Laboratories are to be maintained at 85 deg. dry bulb and 55 percent relative humidity when outdoor temperature is less than 95 deg. dry bulb or 75 deg. wet bulb; system uses 25 percent outdoor air and is divided into eight sections, four per floor, each having a capacity of about 8,400 cfm.; filters of renewable air mat paper-media type; cooling, preheating and reheating coils are non-ferrous; fan-type humidifiers; two ceiling diffusers in each laboratory module; air-return grilles located in exterior walls; pneumatic-type automatic temperature control.

Refrigeration—Plant consists of two 75-hp. radial freon compressors, two dry expansion-type water coolers and close coupled circulating pump; two evaporated condensers located on laboratory roof.

BIG JOB DONE AND MORE AHEAD

Rebuilding Manila

Herbert Leopold
McGraw-Hill World News
Far East Bureau

***Contents in Brief**—Following the preliminary story of Manila's rebirth (ENR Feb. 7, 1946, vol. p. 221), here is the full tale, also written on the spot in Manila, of how U. S. Army engineers revived the port and other public services and how Philippine authorities, relying on American advisers, are now blue-printing reconstruction of the terrifically damaged central city through a master plan for new roads, bridges and neighborhood units.*

RECONSTRUCTION of the city and port of Manila, "Pearl of the Orient Seas," is one of the biggest rebuilding jobs Americans anywhere have been called on to help undertake in the wake of war.

The scope of devastation was vast, and the job still ahead remains enormous. Out of $200 million worth of Manila buildings before the war $158 million worth, or 74 percent, went up in flames or were blasted in the fighting. Elsewhere in the islands $160 million worth of damage, at pre-war values, was sustained by houses and public works. And all this befell a country whose normal annual foreign trade balances at $150 million.

Permanent reconstruction is just beginning to get under way, but Manilans today are able to live and do business, see movies, switch on electric lights, drink water from the tap, and move about town in public conveyances of a sort. The harbor, though it remains a bad bottleneck in the revival of trans-Pacific shipping, has also undergone a remarkable transformation from the shambles it was when the Americans moved in.

Renascence at the Port

The first job tackled was this reconstruction of the port. From September, 1944, to February, 1945, the American armed forces performed the amazing job of putting Manila port so thoroughly out of commission that Japanese demolition experts could add little to its destruction before they withdrew. Then, from March through August, 1945, the Army Engineers came in and rebuilt the port's facilities to handle 125,000 ship-tons of cargo a day—four times the pre-war figures. By August they had it ready for the proposed invasion of Japan. The map (Fig. 2) shows the piers they patched up, and the new ones they built.

With a total port area of 700 square miles and a circumference of 120 miles, all at the far point of an almost fully enclosed bay, Manila ranks among the largest and best protected harbors in the Orient. The port area is divided by the Pasig River into a northern and southern section, and, by two breakwaters which converge on the river mouth, into an inner and outer harbor —making four sections altogether. The entire port area is fairly shallow, and navigable approaches must be maintained by constant dredging along a lane 500 ft. wide. The river is navigable for interinsular shipping up to the first bridge which spans it (Jones Bridge), and its quays and warehouses form an important part of the harbor facilities.

South Harbor—older, deeper and more fully developed than the northern section—consisted in 1941 of four piers with 11 berths, giving a total available berthing length of 6,700 ft. Outstand-

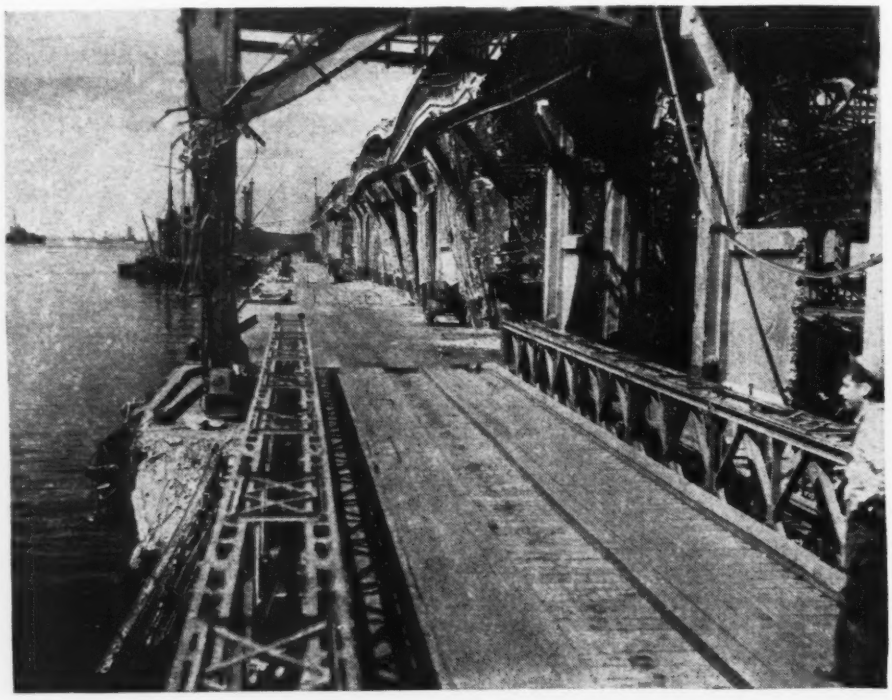


Fig. 1. Bailey bridging was used to span the breaches in Pier 13, claimed to be world's largest.

ing among these was Pier 13 (formerly known as Pier 7) reputedly the longest finger pier in the world (1,470 ft.) with berthing accommodations for six Liberty ships and with the most up-to-date cargo-handling facilities in the whole port area. It had a reinforced concrete slab and girder type deck resting on 24 in. square concrete piles. The transit sheds on the pier were reinforced concrete structures and had galvanized iron roofs, the latter supported on steel roof trusses.

The other piers were of reinforced concrete on a structural steel framework, resting on steel cylinders and timber pile foundations.

All of the piers (3, 5, 9 and 13 on the map), in addition to two wharves for shallow-draft vessels, were taken over in March, 1945, in a state of utter devastation.

Repairing pier breaches

Japanese demolition experts had blasted three gaps across the entire breadth of each pier, breaking the piers up into as many islands. In addition to these breaches, Pier 13 had minor bomb holes in the center and a heavily damaged apron. The superstructure of the transit sheds extending over most of the length of Pier 13 had entirely collapsed, and most of the wall surface had caved in, as shown in Fig. 1. Only one Liberty berth length on the northern side of the pier was not blocked. In order to make it available, divers cleared the wreckage from the apron. Partially collapsed sections of the superstructure were completely removed by demolition and cutting, while non-obstructive members were shored and braced.

The breaches in Pier 13 were now spanned with four single-double and two double-single Bailey bridges to restore one-way traffic around the pier (see Fig. 1). The breaches were next cleared of all debris, while divers removed all concrete and reinforcing from piles found usable and restored the square surfaces by chipping with pneumatic hammers. Reinforcing rods were spliced to usable rods and concrete was poured. A standard pile bent with piles 5 ft. on centers was then driven and capped immediately alongside the edge of the breach. Irreparable concrete piles were made usable by driving four wooden piles on a batter straddling the stump and tying them at the top. A cap plate was then drifted

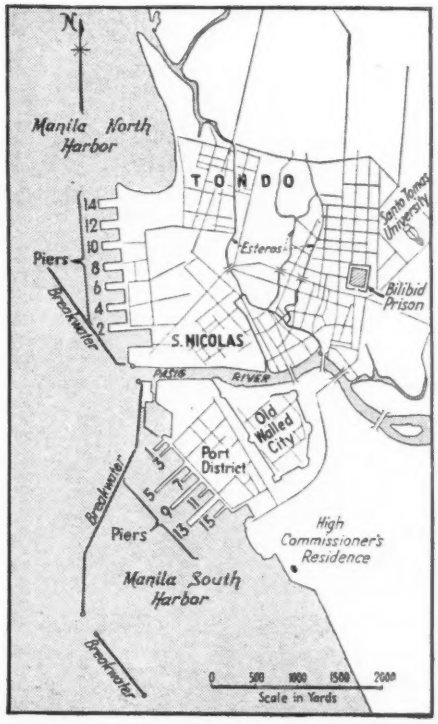


Fig. 2. Docking facilities at Manila are located north and south of the mouth of the Pasig River. Ocean vessels all dock in the South Harbor.

to this cluster. Steel beams were placed parallel to the longitudinal axis of the dock from the bent immediately alongside the far edge. Caps were bolted to these beams and then stringers and decking were placed in accordance with standard practice, permitting removal of the Bailey bridging. Smaller bomb holes were repaired by hanging forms from bents at each side of the breach and pouring concrete in standard flat slab design.

Timber extensions to piers

The next job tackled was the restoration of Pier 9, South Harbor, 650 ft. long and 165 ft. wide. This pier had, in addition to the breaches, a completely demolished transit shed which had to be entirely removed. The clearing of the approaches was carried out with heavy floating cranes, while large crawler-type cranes and trucks worked from the top of the dock. Creosoted timber piles replaced damaged piles, and caps and stringers were then placed in the usual manner.

After restoration of the original pier a 300 ft. x 165 ft. full-breadth extension was built. This is a standard "theater of operation" timber pile dock. To produce the requisite pile length of 120 ft., four splicing ways had to be erected near the construction site. The job was completed May 17, 1945, a little over two months after the Engineers had taken over.

Pier 5, South Harbor, of nearly the same dimensions as Pier 9, presented almost the same engineering problems and was restored by the same methods, but the extension was constructed to a

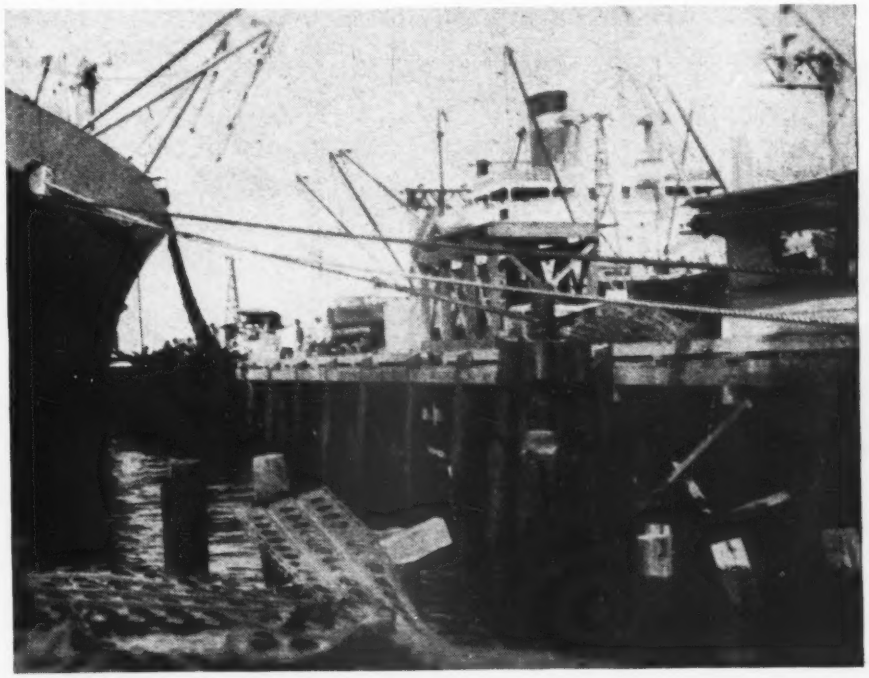


Fig. 3. Several theater-of-operations-type piers such as this were built, including two long extensions to existing piers.

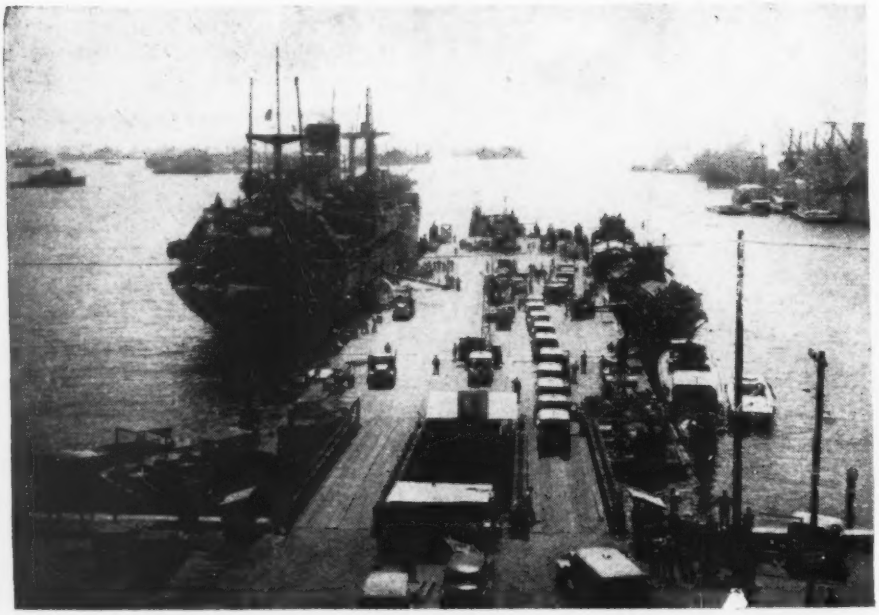


Fig. 4. For a quickly serviceable extra pier, Navy pontoon units were combined into a floating platform linked to the shore by Bailey bridging.

Fig. 5. Manila's battered skyline along Pasig River. Gutted office buildings like these have been partly refitted for use. Some may have to go entirely to provide right-of-way for widened streets.

length of 425 ft. instead of 300 ft.

Additional berthing space, beyond that available from extensions to existing piers, was created through construction of two finger type pile docks of 430-ft. length and 80-ft. width (Piers 7 and 11. These are of standard "theater of operation" design, except that batter piles were added to the outside of each bent to provide extra strength under typhoon conditions.

Another increase in berthing capacity was provided by two floating Navy pontoon docks, located north of Pier 1 and south of Pier 13 (see Fig. 4). Made up of the familiar 5x5x7-ft. steel boxes joined together with standard hinge assemblies, the piers were joined to the shore by two 70-ft. Bailey bridges equipped with lubricated sliding supports on the pontoons. Construction of these facilities consumed only five and eight days respectively.

The North Harbor reconstruction program consisted mainly in paving five piers that were uncompleted when the war began, and laying double railroad tracks along each side. These piers consist of concrete walls forming an enclosure which was filled with dredged material. North Harbor, because of its shallowness, is not suitable for deep-draft, ocean-going vessels, and the foundations of the piers have not been sunk to sufficient depth to allow extensive dredging of the slips.

All in all, port reconstruction involved the removal of 3,240,000 cu. yd. by dredging, the use of 500 tons of structural steel, and the driving of 8,750 piles aggregating 150 miles in length.

The project was carried out under the direction of Col. P. Z. Michener, area engineer, Port of Manila, Luzon Engineering District. Among the units engaged in the construction work were the 1,060th Engineer Port Construction & Repair Group, 869th Engineer Aviation Battalion (less two companies), 1,052nd Port Construction & Repair Group (First Dock Section), and the 1,054th Port Construction & Repair Group (First Dock Section).

The Engineer troops, 1,800 in number, were augmented by 1,500 to 2,000 civilians on a round-the-clock schedule. Of the eighty divers employed in the rehabilitation job, twenty-four made surveys and cleared underwater debris at the piers, while fifty-six, under the control of the U. S. Navy, helped salvage underwater shipping.

Subsequent operations under the direction of GENED (General Engineer District), AFWESPAC, have been mainly concerned with maintenance and repairs, but include also the building and maintenance of fuel storage facilities and pipelines required to help support the late operations on Luzon.

Manila harbor today

By May, 1946, eight docks in the port had been turned back for commercial use, providing as much space as in 1941; but commercial traffic was already in a log-jam. Ships have to wait as long as four to six weeks before docking. The reason for this is that unloading capacity of 240,000 tons a month at the eight piers is bottlenecked by private trucking capacity of only 72,000 tons a month, no transit shed capacity at all, and warehouse capacity nearly nil.

The Philippine Bureau of Public Works, which now has responsibility for port improvement, as a temporary expedient plans to set up three warehouse sheds near the piers at a cost of $400,000 each since the patched-up piers cannot support heavy warehouse

structures. But eventually the existing Army-repaired piers will have to be rebuilt, or new concrete-decked structures will have to be constructed on their site or at other points on the shoreline. What is accomplished depends largely on action taken for war damage settlements under the Tydings Act, which earmarks $120,000,000 for Philippine reconstruction.

City rebuilding charted

Turning to reconstruction of the city itself, it is estimated that 8,400 residential structures in Manila were damaged during the war, 8,000 of these beyond repair. The damaged buildings represent a total of 24,000 dwelling units affecting 135,000 persons out of the 800,000 population. About 10,000 of Manila's homeless remain badly sheltered even by the barest emergency standards; all others are housed in palm shacks or refugee camps.

New building is beginning to start up. Building permits issued for the year ended April 1, 1946, totaled 4,116 for construction valued at $9.7 million. But materials are still in very short supply. Seventy percent of the sawmill capacity is gone, and transportation problems hamper import of new U. S. equipment. The two cement plants in the islands, one nearly useless, are being operated by the U. S. Army, and for years to come all heavy construction work will have to depend on American cement.

No building permits are being issued except in accordance with rezonification laid down in a master reconstruction plan. Such a master plan has been evolved by Louis P. Croft, formerly connected with the National Park Service, Washington, D. C., and the city planning firm of Warren H. Manning, Boston, Mass. Since 1940 Mr. Croft has been the Commonwealth president's adviser on land planning, later on city planning. The office was created before the war with an eye to certain long-range planning projects, and the exploratory work done up to the Japanese occupation provided a valuable foundation for the reconstruction blueprint.

Mr. Croft, considering Manila's organic relation with the island of Luzon and the national highway system, started with a general plan of major city thoroughfares, as shown in Fig. 9. Laid out in a spider-web pattern, radial and circumferential roads cut the city into "superblocks" for commercial and industrial facilities and into neighborhood units for residential use. The downtown district is in the center of the web. All of the proposed routes, designed to handle traffic at a safe and economical speed and to relieve congestion of minor streets, are planned to be part of the national road system.

Fig. 6. Only major example of new construction in Manila is the Bataan Theater, at foot of Sta. Cruz Bridge.

Eight bridges to span river

The proposed network calls for eight major bridges over the Pasig River, five of which will have to be built. The projected new crossing at the mouth of the river will relieve Jones Bridge (now the first bridge spanning the river) of much of the heavy traffic from the South Port area. With a view to easing the traffic jam north of Sta. Cruz Bridge (now the second bridge upriver), this ancient Manila landmark, already thoroughly demolished by Japanese dynamiters and now temporarily patched up with Bailey bridging, will entirely disappear. By the increase in number and more advantageous spacing the river crossings will insure an uninterrupted flow of traffic, which was impossible under former conditions.

Upon approval of the major thoroughfare project the planning office proceeded to map out details for the

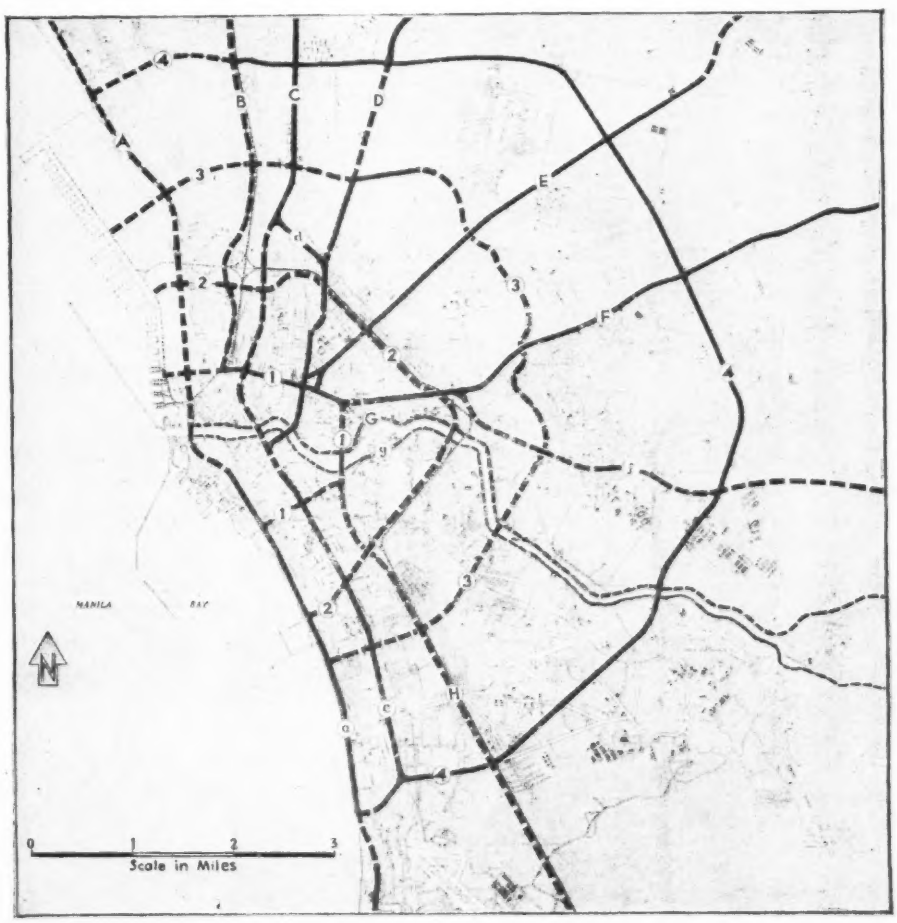


Fig. 7. Manila's network of arterial highways would be greatly expanded under plans drawn up by the Commonwealth president's adviser on land and city planning.

reconstruction of the heavily-damaged downtown district of Manila. The area affected comprises about 370 acres of the most valuable land in the city. Seventy percent of the urban population is crowded together in this area, which covers only 10 percent of the total city surface. The area's prewar land use, as contrasted with planned future use, is shown in the "before and after" maps of Fig. 8.

The objectives in replanning this district were to clear up the odd jumble of stores, residences, offices and factories which formerly existed and were partially restored in the makeshift rebuilding rush that followed American re-occupation; to solve the lack of open spaces; to remedy the chronic traffic congestion, partly by relieving the area of all through traffic; and to fit the district into the general pattern for an organic and functional metropolitan Manila with an ultimate anticipated population of 2,000,000 by 1980.

The Escolta, a heavily congested shopping and business street now lined with gutted reinforced concrete buildings, will be widened to create space for two traffic lanes in each direction and parking strips on each side of the street. Arcaded sidewalks will protect pedestrians from the blazing Manila sun.

Riverside Drive, a badly needed traffic route along the northern bank of the Pasig River, will be an entirely new road project with three traffic lanes in each direction, an open promenade along the river and an arcaded sidewalk on the northern side. Rizal Avenue will be extended southward to Riverside Drive.

Plaza Sta. Cruz in the south-center of the area will be enlarged and redesigned to provide for convenient and safe circulation of vehicular traffic through the hub of the commercial district. Elimination of Sta. Cruz Bridge will further assist in relieving the heavy congestion.

"Esteros" to be drained

The irrational development of Manila's downtown street system is to some extent due to the troublesome interference of the *esteros*. These creeks or canals, which are part of the Pasig River system, will have to be filled in where they obstruct the new city plan. Others will be drained by underground pipes or culverts and properly landscaped.

Housing plans are highlighted by establishment of "ideal" neighborhood units, to have local shops within walking distance from homes, and well-placed local industries. An elementary school with playground is the nucleus of each unit.

In making more detailed plans for housing in the downtown district, prevention of overcrowding will be the guiding principle. The old Bilibid Prison (large speckled area in the prewar chart) has been earmarked as a site for a government housing project. The plan calls for removal of industrial installations from the core of the downtown area, the whole North Port area being recognized as the logical site for future industrial development.

The Manila rebuilding plan has conditioned the progress of public works rehabilitation in the city area as well as the reconstruction of damaged utilities, such as water, sewerage, electric power and communications.

Army emergency repair jobs on various projects were completed between six and twelve months after liberation, and the responsibility for improving and maintaining existing facilities will soon have fully reverted to Philippine civilian authorities.

It would have been impossible for the Commonwealth government to continue the work had the Army not turned over all equipment used during the military rehabilitation stage. The Foreign Liquidation Commission, on instructions from the Army, has distributed to District Engineers approximately $850,000 worth of roadbuilding and other equipment. Under the terms of the Tydings Act a maximum of $100 million worth of surplus property will also be transferred to Philippine government agencies. And there will be more American help, particularly in the field of roadbuilding.

A highway planning commission of seven U. S. Army and Navy engineers headed by Lt. Col. Arthur J. Siegle has

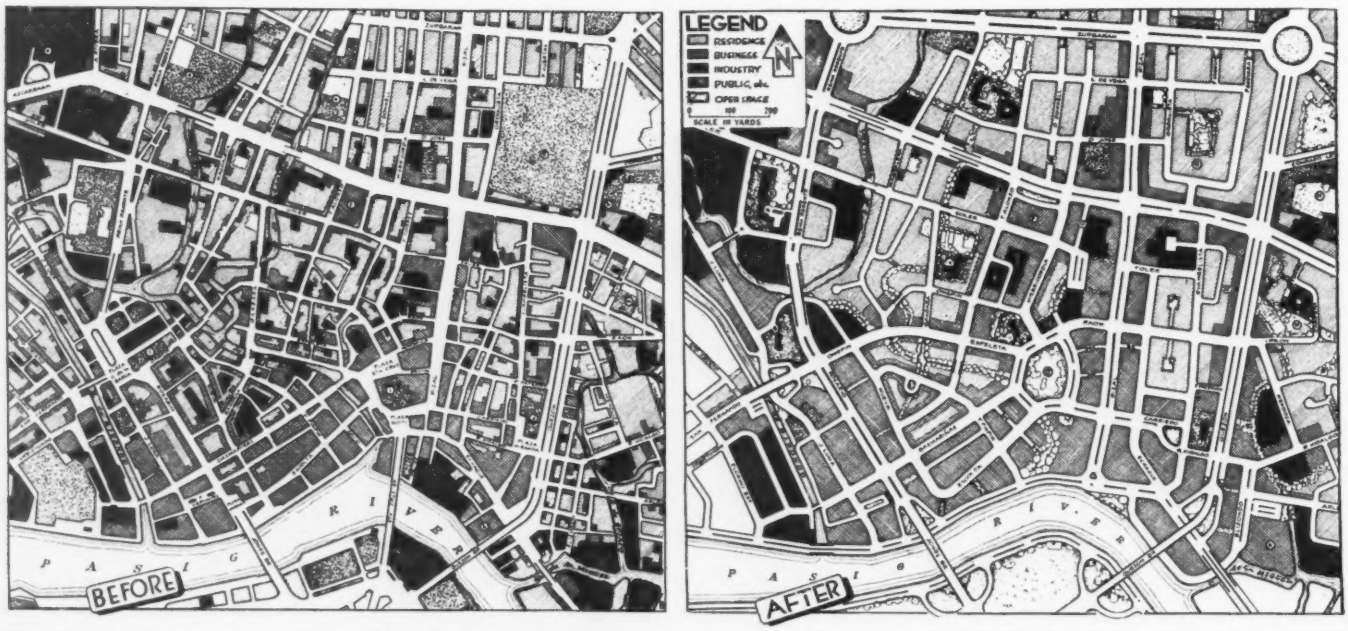
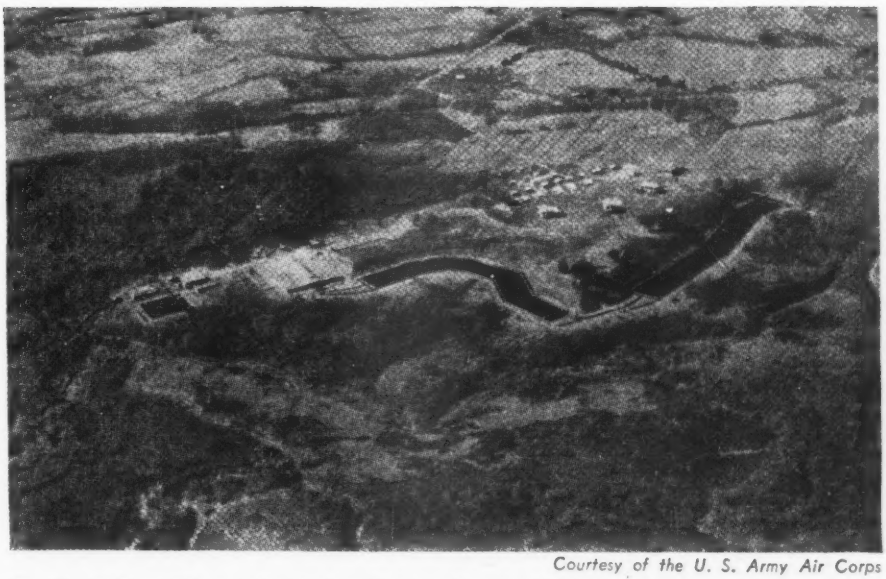


Fig. 8. How Manila plans to transform its downtown area is indicated in "before" and "after" maps. Postwar plans would shove most industry out of this area, turn it into a region of broad boulevards, new squares and bridges, and "ideal" neighborhood units.

gathered spot information regarding the conditions of roads and bridges in the Philippines. A similar inspection was undertaken by Federal Works Administrator Philip B. Fleming and Thomas H. MacDonald, Public Roads Administrator. The FWA is one of the American agencies likely to be authorized to carry on programs for the rest ration and improvement of public works in the Philippines within the special $120 million appropriation in the Tydings Bill. General Fleming estimates that road improvements alone will call for a sum of $100 million, but that the Philippine government will be able to contribute $50 million, leaving $70 million of Tydings funds for diversion to other public projects.



Courtesy of the U. S. Army Air Corps

Fig. 9. Balara filters, about six miles northeast of Manila, are the bottleneck for the city's water supply. Present capacity of 50 mgd. will be expanded to 80 mgd.

Water services back to normal

On October 15, last year, the Metropolitan Water District was reorganized on prewar lines to continue the services (water, sewerage, drainage) which had up to that date been operated and rehabilitated by Sixth Army Engineers and the General Engineer District (GENED). While water consumption in 1941 averaged 65 mgd., it reached a peak of 74 mgd. after rehabilitation and now averages 70 mgd.

Manila water supply comes from the mountainous area north and a little east of the city, and is brought about 15 miles in aqueduct to the Balara filter plant about 6 miles from the central business district. Water is stored by two dams, the Ipo dam on the Angat River at the upper end of the aqueduct, and the Lamosa dam which creates Novaliches reservoir a few miles north of the filter plant. The old Montalbar reservoir about 10 miles northeast of the filter plant was abandoned in 1940 when Ipo Dam was completed.

The bottleneck in the Manila water supply system is the Balara filtration plant. Completed in 1935, it is of the rapid sand type with a capacity of 50 mgd., and provisions for an increase to 80 mgd. The consumption above 50 mgd. must now be by-passed after chemical treatment and settling. Tests show that it has been possible to maintain a water quality well within drinking water requirements although turbidity is somewhat higher than in wholly filtered water. It is believed that the chlorine residual of 1.9 ppm. (about five times the prewar rating) will offset the undesirable effects of the by-passed portion in the city water until the filters can be enlarged to take care of the entire consumption volume.

Another service operated by the Metropolitan Water District is the sewerage system. All pumping stations and mains have now been practically restored, but there remains the task of undertaking certain improvements and expansions as originally projected under a 10-year plan in 1940. Completion of the sewer lines in the sewered portions of the city and extension of the sewer mains to suburban areas will have to be replanned in accordance with the new city layout. However, the unsatisfactory system of discharging the untreated sewage into the Bay of Manila calls for early improvement. It is planned to install additional outfall sewer lines, and construction of a settling tank for partial treatment of the sewage is under serious consideration.

Nine-month blackout ended

Power and street car services were furnished the Manila area before the war by an American concern, the Manila Electric Railway and Light Co., (Meralco) under a franchise to expire in 1953. The company had a 29,500 kw. steam plant in Manila, in addition to a 16,000 kw. hydro installation.

All of Meralco's power supply sources were totally destroyed in the battle of the Philippines, and for nine months after liberation Manila was plunged into total darkness, with power supply to essential services maintained by small Army-operated diesel units. The cars of the tramcar system had disappeared or were burned out, and the company decided to fill in the tracks and be done with it.

Only toward the end of 1945 was a semblance of normal light service restored, when the U. S. Army Engineers' floating power plant *Impedance* arrived from the U. S. and began to feed Meralco's distribution net. One of four sister plants in existence, the craft is 396 ft. long, has two main boilers capable of producing 170,000 lb. of steam per hour and turbines with 30,000 kw. capacity, almost three-fourths of Manila's normal electric power requirements.

Supplementing the *Impedance*, the No. 1 unit of the National Power Commission's Caliraya Dam was linked up to the distribution net last October 15, following repair by GENED. Units No. 2 and 3 of this dam will also be ready for service after replacement parts are received from the U. S.

The Caliraya Dam, whose three installed units totalled 37,500 hp. capacity, is a rolled-earth affair with a maximum height of 42 meters and a length of 500 meters at the top. Maj. Gen. Hugh J. Casey, engineering adviser to the National Power Commission from 1937 to 1941, had a large share in the successful establishment of the Caliraya project.

Rehabilitation of Meralco's original two power sources, is still hanging fire, and it is uncertain whether private or public agencies will supply the city's power in the future.

France Rebuilds Its Rail Bridges

McGraw-Hill World News
Paris Bureau

***Contents in Brief**—Phenomenal progress in reopening its blasted rail lines was made by the French National Railways in the months following the liberation, and now the temporary bridges made necessary at that time are in process of replacement. Steel structures are being raised where possible, spans from abandoned bridges are being moved to new locations, and masonry structures are being rebuilt. Materials, equipment and manpower shortages still make progress difficult, but as a result expedients are required that are interesting and instructive.*

At the end of March, 1946, reconstruction of railway bridges in France had proceeded to a point where traffic flow on practically all through lines was possible at reduced time schedules, according to Robert Levy, engineer, maintenance-of-way, S.N.C.F. (French National Railways). Of 2,603 railway bridges destroyed or severely damaged, 1,520 temporary structures and 806 crossings of essentially permanent character are in service. The remaining 277 are held up by shortages of steel and cement, and the necessity of replacing hurriedly-built temporary crossings will mean a continued heavy reconstruction program for 1946 and 1947. Total length of actual damaged sections of bridges, tunnels and overpasses was about 93 miles. Some idea of the magnitude of the work of reconstruction can be had from Fig. 1, which also indicates the remarkable progress made during the first year of work from August, 1944, to August, 1945.

By the end of 1944, repairs of temporary nature, including many detours of considerable length, assured transport of essential military supplies. However, the country was practically cut in two by the Loire River, the passage from Paris southward to Lyon required long detours at slow speeds over secondary lines, and to reach Bordeaux on the southwest coast required a tour of nearly all France.

The winter of 1944-45 saw six major operations completed on a temporary scale: (1) The bridge at Orleans and the viaduct at Maintenon, north of Chartres, (2) the Verberie bridge southwest of Laon on the Oise, opening the "coal road" to the North (3) the Meuse bridges in the vicinity of Mezieres in northeastern France opening the "steel road," (4) the Libourne bridge on the Dordogne River just east of Bordeaux, (5) four bridges, four viaducts and a tunnel between Paris and Lyon and (6) the Montlouis bridge near Tours. By the middle of August, 1945, three difficult Rhone crossings had also been effected (1) the Pont de la Mediterranee, just south of Lyon, (2) the St. Clair bridge at Lyon and (3) the bridge at Tarascon opening more or less direct communication

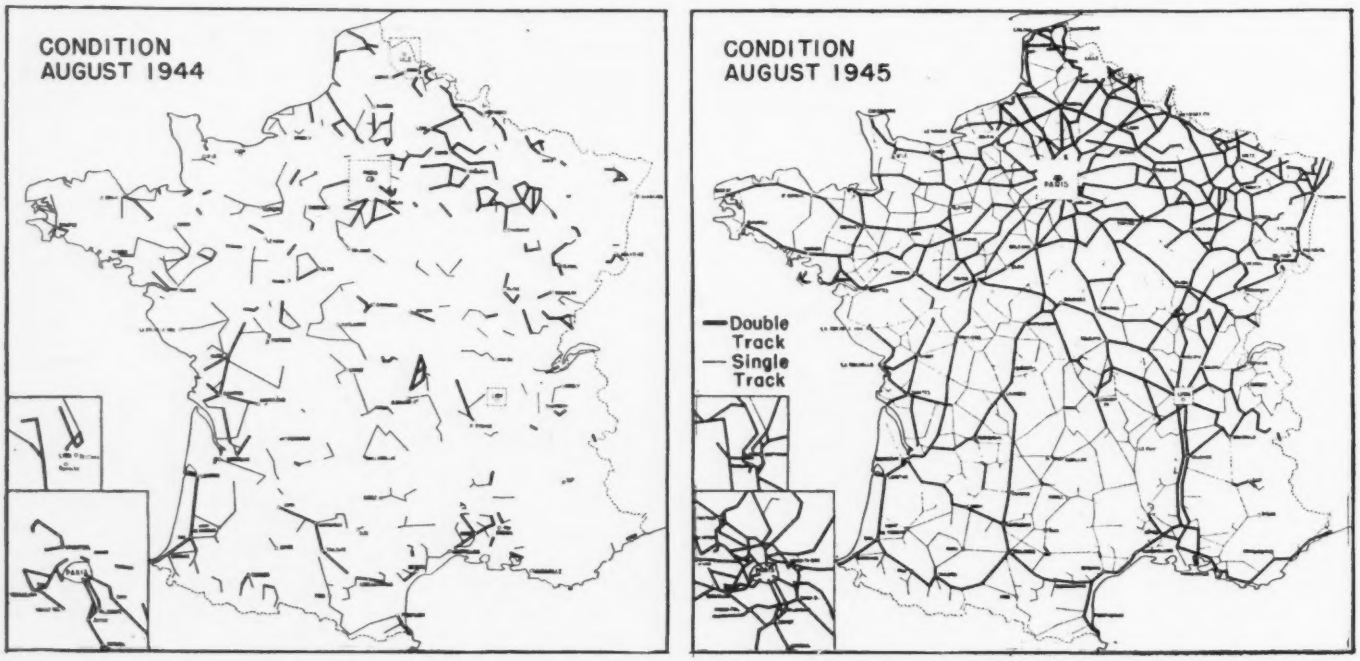


Fig. 1. Degree to which French railways were restored in the first year following the liberation. Many of the broken lines shown in the map at the left were reopened as a result of applied army bridge reconstruction. During the year since the map at the right was made the French National Railways have closed other links and replaced numerous temporary structures with permanent construction.

between Lyon, Marseilles and Bordeaux.

Most of the 300 temporary spans erected by the allied armies were relatively small structures, including only a very few over the larger rivers. One notable exception is the wooden structure at Avignon over the Rhone, but even this had needed much reinforcement to maintain service. In comparison, the S.N.C.F., with help from the Sapeurs of the French military, has undertaken more than 1,350 separate works.

Except for the temporary and hurriedly constructed crossings built by Allied armies across the Rhine, the first assured railway structure over this stream was built at Strasbourg of "tabliers", deck sections preframed with girder and floor beams. Of these deck sections the Germans had removed 2,300 ft. from the depot at Fourchambault, leaving only 540 ft. of prewar stock. During the occupation, however, another 1,400 ft. had been fabricated under cover in the south so that about 2,000 ft. of usable structure was available for reconstruction. With these the Strasbourg bridge was restored to service in the record time of nineteen days.

Materials available

Temporary reconstruction first utilized "tabliers" of 25 to 50 ft. which were in stock, others from 40 to 65 ft. fabricated during the occupation and a number of girders of various dimensions from German supplies that happened to be neither destroyed nor removed.

Fortunately, the Differdange mills of Luxembourg were left intact. These are still the only European source of steel beams as large as one meter (about 40 in.) in depth. These beams made possible the temporary bridge at Orleans by November, 1944, and others since. [Editor's Note—It was from these mills that the U. S. Army Engineers obtained the "meter beams" which figured so prominently in the Rhine bridges that they built.]

For temporary construction, where possible, the classic method of cantilever launching has been employed, and in one or two cases 35 and 50-ton erecting cranes have been used. However, a technique for placing long beams by special cars was developed and first used at Orleans. For this a large beam, to serve as a boom, was

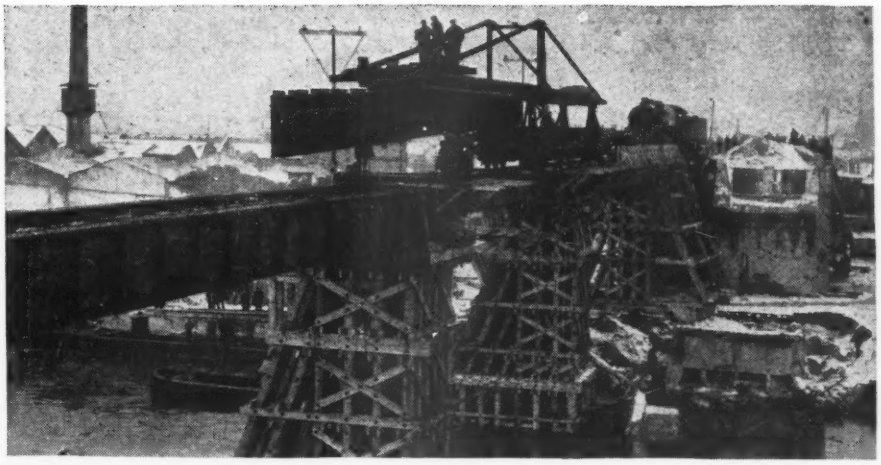
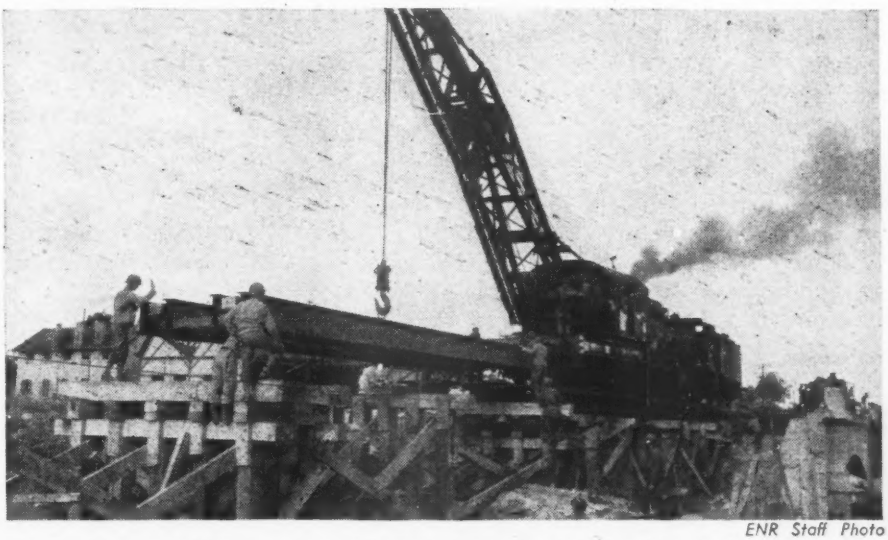
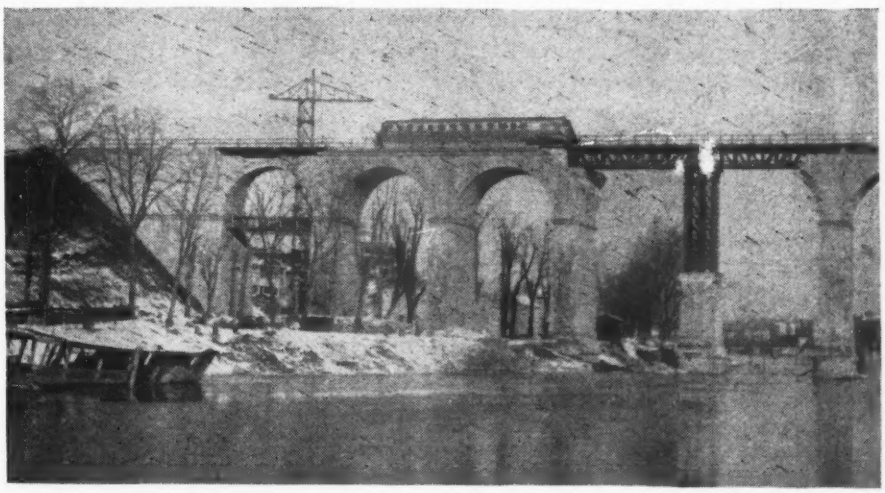


Fig. 2. Special bridge erection car equipped with a cantilever boom capable of setting 100-ft. girders. First used on the Orleans bridge over the Loire, it is shown here placing a member in the Neuilly-sur-Marne bridge.



ENR Staff Photo

Fig. 3. Nearly 2,000 ft. of prefabricated spans such as this, being erected by U. S. Army Engineers at Vitry-le-Francois over the Marne, have been used by the French National Railways in reconstruction work, a notable example being a bridge over the Rhine at Strasbourg.



ENR Staff Photo

Fig. 4. Demountable steel framing of the British "light steel trestling" type, used to build up piers to their original height for temporary reconstruction, will often be retained and enclosed in permanent concrete and stone. This bridge is at Laval.

placed on a car having two trucks of three axles each, the boom extending about 50 ft. beyond the end of the car and weighted in the rear. This boom afforded a path for a carriage equipped with a crane hook. The bridge beam to be placed was brought up on a flatcar, attached to the hook and with relative ease pushed out over the position of final placement. At the Orleans bridge, for example, 60 beams, forming 10 spans, were placed in 14 days, working night and day. (This equipment was also used on a Marne River bridge as described in *ENR* July 12, 1945, and similar equipment was built in the field by U. S. Army Engineers.—Editor).

Steel used for temporary piers

A second larger version of this erection equipment, used first at Cinq-Mars near Tours and later at Choisy on the Seine near Paris, allows placing of assembled structures weighing 30 tons and up to 90 ft. in length.

For temporary structures, at first only wood was available for reconstruction of damaged piers. Of the many built in this manner, the Bezons bridge on the Seine near Paris is an excellent example, as is also a double pier of great height for the viaduct over the de Lee Valley near Dijon. Later, however, a considerable tonnage of demountable metallic structure (the Light Steel Trestle, or LST, of military fame) was imported from England. From this have been made a number of highly satisfactory piers.

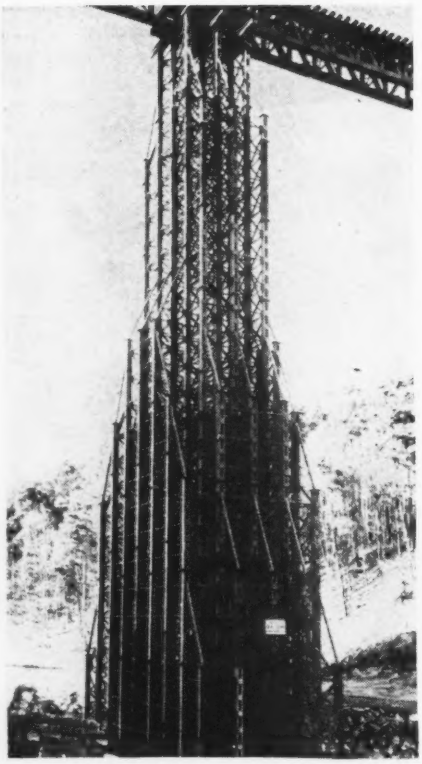


Fig. 5. Military bridging materials have been used to build some spectacular piers such as this one of over 100-ft. height at Martinet west of Belfort. It is known locally as La Cathedrale.

In addition to temporary piers entirely of metal construction, an interesting composite has been developed for more permanent rebuilding of viaducts. Permanent piers were first built to a convenient height depending on the extent of damage. The remaining height was quickly built up of the demountable LST elements. This temporary metal pierwork is later to be incorporated in concrete or stone to become a part of the permanent structure.

For masonry viaducts, where only a few of many arches were broken, it was frequently necessary to support the arches remaining in precarious equilibrium by buttressing against earth or adjacent pier bases, or by cables, the latter being less sure than the former.

In reconstructing steel spans, care has been taken to rebuild damaged sections with as nearly as possible the same characteristics as those of the original structure, but reinforced for new rolling stock with axle loads of 25 tons. Welding has been used extensively.

For steel structures also, every effort was made to raise any parts that could be utilized. In some cases these represented several hundred tons, so that the bridging of actual destruction required only small amounts of demountable structure, prefabricated deck sections or beams.

In general, the procedure for recovering submerged sections consisted of building temporary falsework at either side of the structure to carry gantry cranes, which did the lifting. Not only was the Pontoise bridge near Paris raised by this method, but also another over the Cher near Tours, as well as the Eauplet bridge near Rouen of which a 1,200-ton span was raised intact.

ENR Staff Photo

Fig. 6. Half of Eauplet bridge at Rouen, consisting of two balanced cantilever spans of 260 and 300 ft., dropped into the river by destruction of the center pier was raised by gantry cranes operating on falsework alongside. Weight lifted was 1200 tons. Photo taken before raising was effected.

Arch bridge repaired

An unusually interesting case is the viaduct of Tarascon on the Rhone, which consisted of seven 200-ft. arches each made up of eight ribs of cast iron. Arches 2 and 5 were entirely destroyed, and each was temporarily replaced with three spans of steel beams resting on a pile pier built at the center of each arch span; eventually these spans will be replaced by new arches, but in reinforced concrete instead of cast iron.

The other arches did not fall because of the great mass of the piers which are nearly 30 ft. thick. The piers, however, suffered some displacement, resulting in a downward deflection in

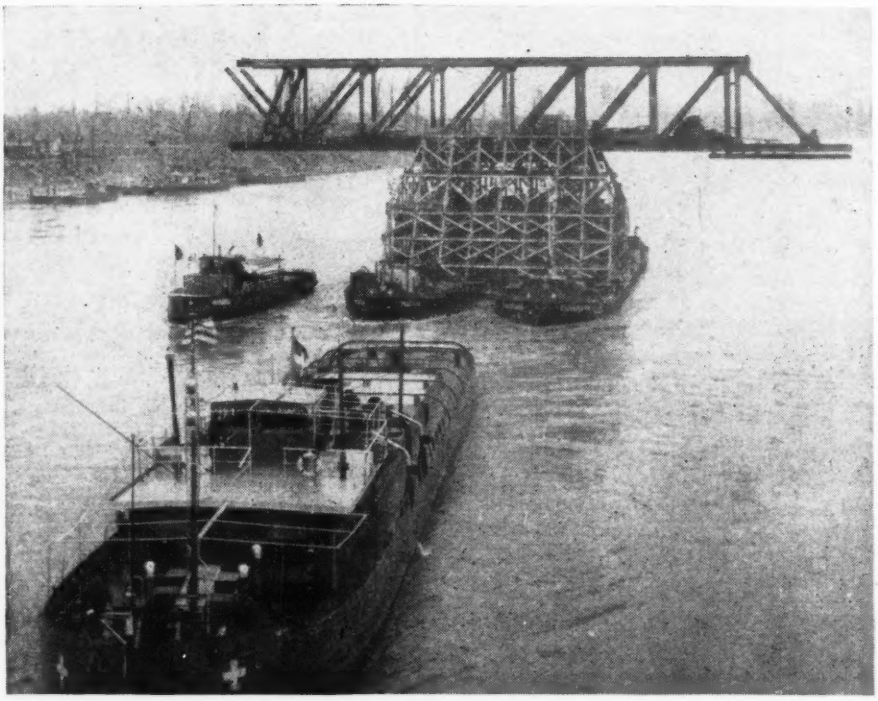


Fig. 7. Transporting half of a 235-ft. truss span up the Rhine from an abandoned bridge at Neuf-Brisach to a new location in the bridge at Chalampe. The other half of the span was transported in the same manner.

ing about 300 tons all told, was towed on barges about the first of February, 1946. The operation was entirely successful, and the second section by now has been handled in a like manner.

During 1945 also, many stone arch bridges were permanently restored to their original condition, two of the most spectacular being the 50-arch viaduct of Chaumont over the Marne on the Paris-Basel route and the viaduct of Bramafan near Briancon at the Swiss border.

In addition to the bridge program, which has reached a point where one-third of the structures destroyed have been replaced by permanent crossings and only one-tenth remain unopened to traffic, the S.N.C.F. also has faced a second huge problem of damaged stations, repair depots, and miscellaneous buildings. Of 50 million square feet of damaged buildings 35 million square feet have been repaired enough to be usable. Of 17,000 damaged dwellings, more than 13,600 have already been restored to use.

arches 4 and 6 of 18 and 22 in., respectively, accompanied by cracking at the crown. Raising these arches was effected by installing eleven 300-ton jacks at the crown and operating them horizontally, against a concrete encasement of the cast iron ribs. An opening of about 10 in. was required, which was then filled with concrete to hold the arch in its original position.

Another special construction job, involving the transport of a 235-ft. truss span some 15 miles up the Rhine, was required for the temporary bridge at Chalampe on the route from Mulhouse to Neuenbourg. The original crossing had, as one part, a steel span of 235 ft. which fell into the river at one end only. This is being raised to its original level. The second span, also of 235 ft., is being replaced with one of the same length from Neuf-Brisach, which remained undamaged and which cannot be utilized at its former location. In this operation of raising one part of the fallen bridge and transporting the truss of another, five Swiss firms have cooperated under the auspices of the Swiss Committee for European Reconstruction.

The Neuf-Brisach truss had to be divided into two parts, one of 130 ft., the other of 105 ft. The first section, mounted on a wood scaffold at the level it would stand at Chalampe and weigh-

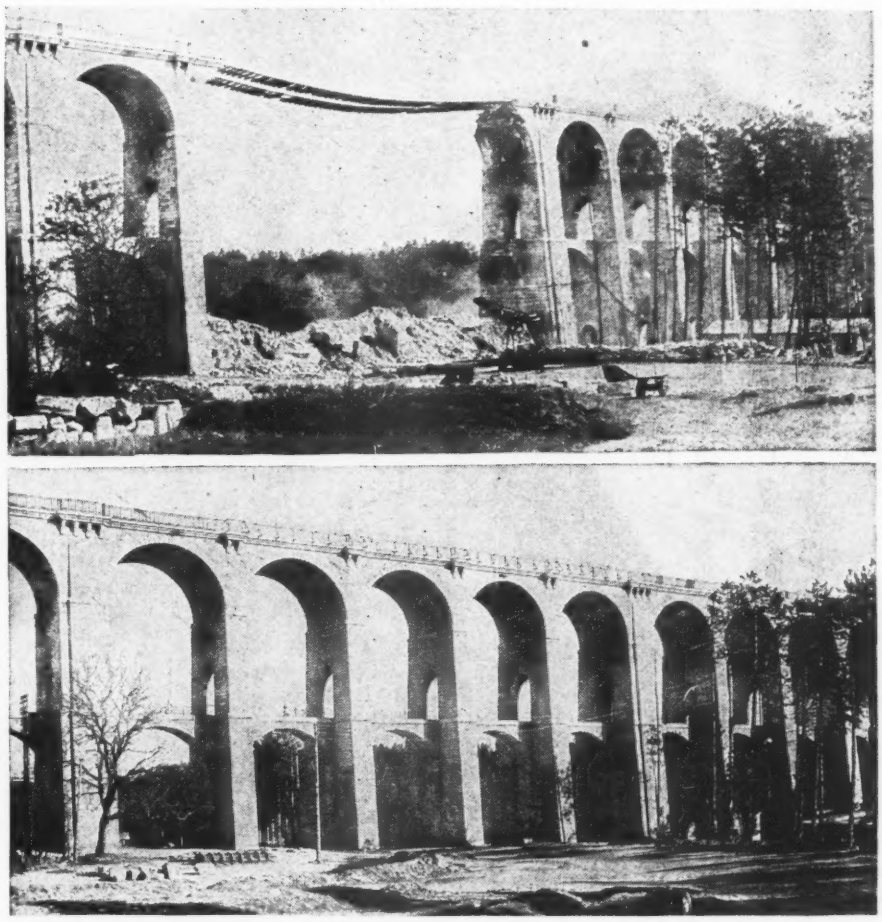


Fig. 8. Before and after views of the high stone viaduct across the valley of the Marne at Chaumont. This is the most spectacular of many masonry reconstruction jobs already completed by the French National Railways.

French Engineers Build Dam With Spillway Over the Powerhouse

***Contents in Brief**—Built in a narrow gorge on the Cere River in France, the St. Etienne-Cantales Dam is notable for its spillway, which is carried over the roof of the powerhouse in such a manner as to form a jet that dissipates the energy of the falling water harmlessly below the dam.*

BOLDNESS in engineering design has been a characteristic of French dams for many years. That it is a continuing characteristic is indicated by the information now becoming available concerning construction operations that were carried forward during the war years despite many difficulties. Typical is the St. Etienne Cantales Dam for a power project on the Cere River, a tributary of the Dordogne River in Southwestern France.

The St. Etienne-Cantales Dam is one of at least three dams under construction in France during the war years at which flood waters are to be discharged directly over the powerhouse, employing a design developed by A. Coyne, inspector-general, Ponts et Chaussees. The two others are l'Aigle Dam on the main stem of the Dordogne River and Genissiat Dam on the Rhone River near the Swiss border. A picture and sketch of the latter were published in the June 17 issue of *Life*. (The statement made in *Life* that flood flows are to be carraied through a side channel was an error. The whole face of the dam is to be constructed as a "ski-jump spillway.")

The St. Etienne-Cantales Dam is the final structure to be built for development of the power resources of the Cere valley. It will impound 125 million cubic meters of water (100,000 acre-ft.) for regulation of the flow at plants downstream. Ultimately, three hydroelectric generators of 25,000 kw. capacity will be installed in the powerhouse just below the dam. Two units have been installed and now are operating. At full pool level, a head of 63 m. is developed at the dam.

Design changed

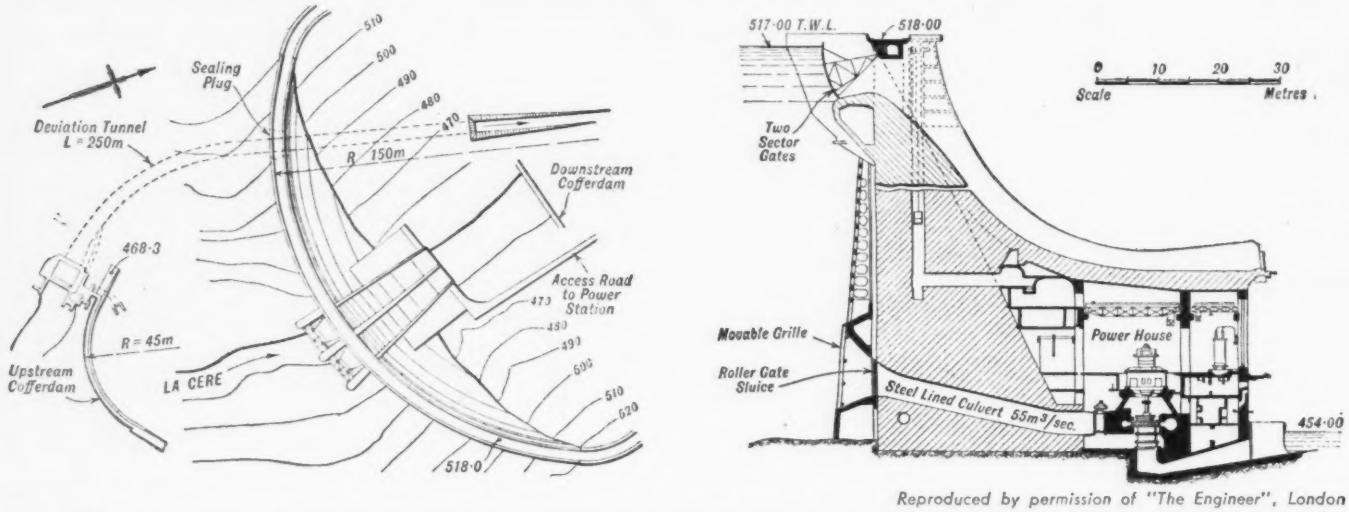
Originally it was proposed to build a multiple-arch dam because the site was adapted to that type of construction, but later, due to the growing scarcity of labor and the vulnerability of the multiple-arch type to air attack, that design was abandoned in favor of a structure that is a compromise between an arch dam and a gravity dam. The present structure has a radius of 150 m. at the upstream face, a height of 70 m. and a crest length of 270 m.

The new design, with its thick spillway slab directly above the powerhouse, also provides for the generating equipment considerable protection against air attack.

Construction was begun in November, 1938, and was carried forward irregularly until 1943, when concreting had to be suspended because of the lack of cement. Meanwhile, however, the powerhouse had been built, and installation of the first generator was completed in the fall of 1944. The whole project was completed late in 1945. After the occupation of France by German forces, many of the personnel formed a clandestine center of the "Resistance" forces.

The dam is located in a gorge of sound granite. A diversion tunnel 6.25 m. in diameter through the westerly wall was used to carry the normal flow of the river during construction. The site was protected against flooding by two cofferdams, the upper one being a thin concrete arch 17 m. high which served to form a small reservoir for partial regulation of the flow for power plants farther downstream. The lower cofferdam also was of concrete, but this structure was not of the thin-arch type construction.

Upon completion of the dam, the diversion tunnel was closed with a con-



Reproduced by permission of "The Engineer", London

Plan and section of the St. Etienne-Cantales Dam showing the location and arrangement of the spillway above the powerhouse.

crete plug at about the mid-point. This plug contains a passageway that is sealed with a heavy steel plate, secured by bolts, which can be cut away with explosives should it be necessary to drain the reservoir at some future date.

Provision for flood flows

As noted previously, the spillway is located at the center of the dam with its discharge channels carried directly over the powerhouse to a slightly upturned lip that throws the stream out over the pool below the dam to a point where any erosion that might occur would be of no consequence. The total fall from crest to tailwater is 60 m. (about 200 ft.). Where the spillway crosses the powerhouse it is made integral with the roof, being a heavily reinforced concrete slab three meters thick.

This spillway, which is controlled by two sector gates at the crest, has a capacity of 1,200 cubic meters per second or about 0.25 cfs. per acre of drainage area. In case of necessity, an additional 110 cms. can be discharged through the turbines and 80 cms. through a discharge culvert 2.5 m. in diameter which was built under the eastern end of the powerhouse for desilting purposes.

Three steel-lined pressure conduits 4.15 m. in diameter through the central part of the dam supply the hydraulic turbines. They are controlled at their upper ends by roller-type penstock gates and at the lower end by butterfly valves. The upper gates are operated from the top of the dam, the gate stems rising at the sides and between the spillway openings. Movable trash racks protect the penstock intakes.

Data on which this article is based were obtained from *The Engineer*, London, and from A. Coyne, designer of the type of spillway used for the project. The plant is owned by the Societe des Forces Mortice du Cantal, of which A. Parisot is general manager.

Flood waters passing over the St. Etienne-Cantales Dam in January, 1945, before construction was completed. The sand piled on the powerhouse roof is a reserve supply stored when rising water in the reservoir began to flood the sand pit.

Annual Waterworks Reports Could Make Good Publicity

Only a relatively small percentage of waterworks reports, prepared annually by municipalities, are distributed locally or used for local publicity, according to a recent survey among several water departments. This was the conclusion reached by M. P. Hatcher, director, Water Department, Kansas City, Mo., in a report presented at the recent convention of the American Water Works Association. Of the municipalities contacted, said Mr. Hatcher, only one showed an appreciable amount of local coverage—70 percent of its annual reports were distributed locally.

A summary of replies received from six departments serving 500,000 consumers disclosed only 26 percent of the reports were to consumers. Twenty percent were sent other departments, 16 percent to libraries and universities and only 15 percent to magazines, state and federal agencies and industries. Consulting engineers received 4 percent of the reports mailed.

Some departments are utilizing small news sheets, mailed with their water bills, as a means of acquainting the consumer with his water works property and its operation. Notable examples of this procedure are to be found at St. Paul, Milwaukee and Omaha.

Golden Gate Bridge Vibration Studies

VIBRATION STUDIES on the Golden Gate Bridge to determine the nature of motion caused by wind are being made with the aid of ten vibration recording instruments recently installed in the main and side spans. The purpose of the studies is to check theories and formulas dealing with the wind-induced motion of suspension bridges. Results could have a fundamental effect on bridge design.

A continuous record of vertical motion is being made simultaneously at ten points on the bridge. In this way it is hoped that data on the nature and amplitude of vertical movement of the various parts of the structure may be coordinated. Previous reference to the instruments and a discussion of preliminary plans for their use appeared in *ENR* Sept. 21, 1944, vol. p. 373.

The studies on wind tunnel models have checked out well, but full-scale verification of theories and adaptations would constitute valuable confirmatory data. The Golden Gate Bridge, as the longest suspended span yet built, affords an attractive opportunity for field tests, and it was selected for the comprehensive program of vertical vibration studies now under way. The results are expected to advance the general knowledge of aerodynamic effects on all suspension bridges and, increase the confidence with which plans for future suspension spans can be drawn.

Ten instruments installed

Four instruments are located on the west sidewalk of the main span, two on the east sidewalk and two on each of the side spans (Fig. 2); all are protected by suitable small houses. The instruments are thus distributed in order to reveal the complete form of the motion. The use of instruments on both sides of the bridge is expected to record the difference in movement between each side. This is considered desirable as preliminary studies indicated that the bridge movement may not be symmetrical about the roadway centerline.

In principle, these vibration recording instruments are what are known to seismologists as slow motion accelerometers. A weight hung on a spring is subjected to an acceleration due to the motion of the bridge. The force resulting from the bridge movement acts upon the spring to cause motion of the weight in reference to its support. This motion is transmitted by means of lever-arms to a pen which records on a revolving drum and, where there is no recordable movement, the pen will make a straight line. The amplitude of the bridge motion can easily be determined from this record by means of a simple formula.

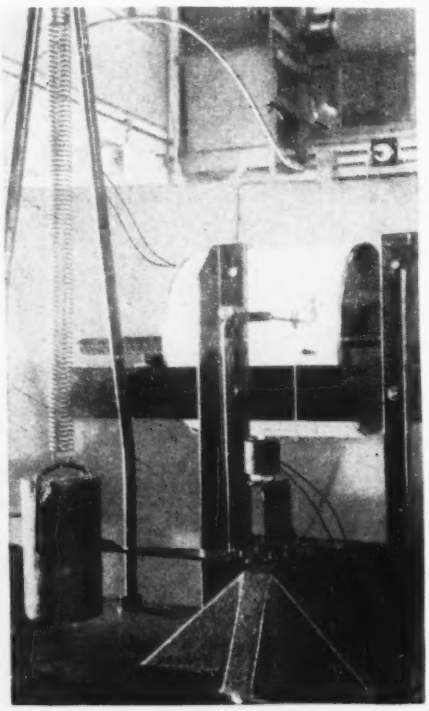


Fig. 1. One of the vibration recording instruments used in the Golden Gate Bridge vibration studies. It keeps a continuous record. A central control mechanism synchronizes it with others.

The sensitivity of the instrument can be altered by changing either the suspended weight or the spring constant (resiliency) of the supporting spring or both. Damping is provided to confine the vibrations recorded substantially to those induced by the bridge motion i.e., when vertical motion of the bridge stops, the spring and weight system of the instrument also tends to stop vibrating. Damping also minimizes or practically eliminates the response of the mechanism to high speed vibrations such as those resulting from traffic. The damping is accomplished by a honeycomb-like nest of thin brass attached to the weight and suspended in oil.

Traffic causes vibration with periods on the order of 1 sec. The bridge as a whole, on the other hand, has a natural period of about 7.6 sec. The instruments were artificially calibrated for periods ranging from about 2 to 10 sec. (essentially the sensitivity range of the instrument). This range is expected to cover all significant movements of the bridge.

All ten instruments are synchronized by simultaneous lifting of all pens at 5-min. intervals. The mechanism for lifting the pens is located in the south tower and consists of a clock unit and a tripping device which, by remote control, actuate a solenoid on each pen. To make a recognizable break in the record, the pen in each instrument is held off the drum by the solenoid for 5 sec.

To have a common reference point on the record from each instrument, the tripping device is operated manually once during the day. Thus the pen is lifted from all of the sheets for an extra period (usually about 1 min.). This is done just before the instruments are taken out of service one at a time for a short period while a new sheet is being installed at the end of each 24 hr.

A continuous record of velocity and direction of the wind is also kept by

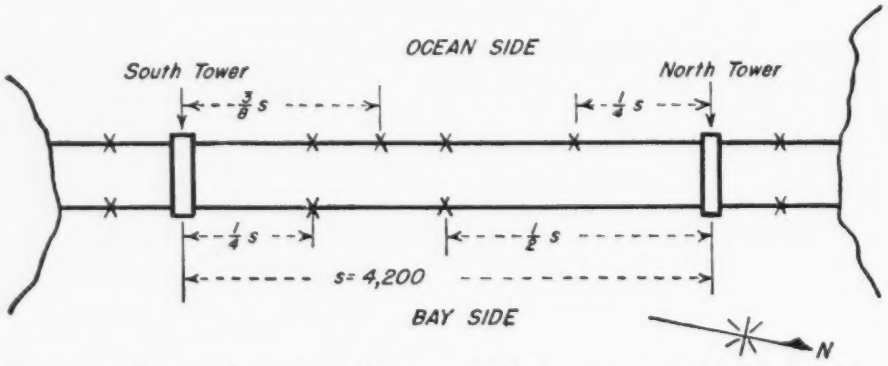


Fig. 2. Locations of the ten vibration recording instruments on Golden Gate Bridge. The instruments on the side spans are placed at the center of those spans.

instruments. Thus, as vibrations are recorded, the nature of the wind that induced them will also be known.

Purpose of the studies

The studies now under way are designed to obtain data on the type of motion involved i.e., whether it is vertical oscillation, torsion, or something else. Vertical oscillation is the movement of the bridge in which both sides move up and down in synchronism and with equal amplitude. Pure torsion is vibration in which the cables move with equal amplitude but in opposite phase. On the original Tacoma Narrows Bridge, whose failure focused attention on bridge movements under wind, vertical oscillation had been observed many times, and just before failure pure torsion was observed. However, authorities believe that the motion that will be observed on the Golden Gate Bridge will be torsion, and that the cables will move with unequal amplitude. The difference in kind of motion on these two bridges is ascribed to the girder-type stiffening of the Tacoma Narrows Bridge and the truss stiffening of the Golden Gate Bridge. The studies now under way may further clarify this.

It is expected that a wind from the southwest or west (at right angles to the bridge) will induce the maximum vibration. In previous studies with one instrument located at the center of the bridge, a 75-mph. wind from the north (the direction of the strongest winds in this area), blowing down the long axis of the bridge, induced no serious vibration.

These studies do not take into account vertical angularity of the wind. It is believed that winds which deviate from the horizontal may induce more motion than horizontal winds. This may be the subject of future studies.

The studies are being made by the field observation committee of the Advisory Board of Investigation of Suspension Bridges, Raymond Archibald, chairman. Direct participants are the Golden Gate Bridge & Highway District, L. H. Nishkian, chief engineer, and the Public Road Administration, of which T. H. MacDonald is commissioner, and E. F. Kelley is chief of the Division of Physical Research. Prof. F. B. Farquharson, University of Washington, is in charge of the Seattle wind tunnel. G. S. Vincent, bridge engineer, Public Roads Administration, is resident representative of that organization on the wind tunnel studies and field studies.

Concrete Wharf Deck Built on Creosoted Wood Piles

A COMPOSITE WHARF made of a reinforced concrete deck slab supported on creosoted timber piling recently built at Powell River, B. C., combines the low cost and relative ease of timber pile construction with the fireproof, long wearing qualities of a concrete deck.

Designed to carry heavy equipment and mill supplies, the heavily reinforced 7-in. deck slab of the wharf is supported by beams 22 in. deep in which are embedded the tops of the piles as shown in the accompanying illustration. In the forms for these beams extra reinforcing was provided in the shape of a steel cage or cylinder set in place around the top of each pile to strengthen the wharf against wave action and ship impact. The cage was fabricated by winding heavy steel wire around a rotating mandrel whose diameter slightly exceeded that of the pile; spacers were used to maintain uniform separation between turns of the helix so formed. When the wires were fastened and the mandrel withdrawn, the cage had sufficient stiffness to hold its shape during handling.

The wharf is 702½ ft. long with a width of 20 ft., which is increased to 40 ft. for 350 ft. at the loading end. At the sea end there is a ship-loading head 155x44½ ft. Later a traveling crane can be installed.

The wharf is carried on 426 fir piles treated with 14-lb. retention creosote. Pile bents are placed at 14-ft. centers and contain six plumb piles, two bracing piles and a fender pile at the loading side of the structure. Piles on the outer edges are braced with 4x10-in. timbers, which are also creosote treated.

The job required 1,040 cu.yd. of concrete for which 42,000 sq.ft. of form surface contact was required. The total cost was $83,000.

Pairs of wooden blocks bolted to the creosoted piles served to support the deck forms during construction. These blocks were turned to have vertical grain bearing, and the bolts were large enough to transmit construction loads in bearing. After the forms were stripped, the blocks and bolts were removed from the piles, the holes treated with creosote and then plugged with creosoted wood plugs.

The wharf was designed for the Powell River Co. Ltd., Powell River, B. C., by Harry Powell, of Seattle, Wash. Construction was carried out under the supervision of Harold Moorhead, plant resident engineer, by the Northern Construction Co. and J. W. Stewart Ltd.

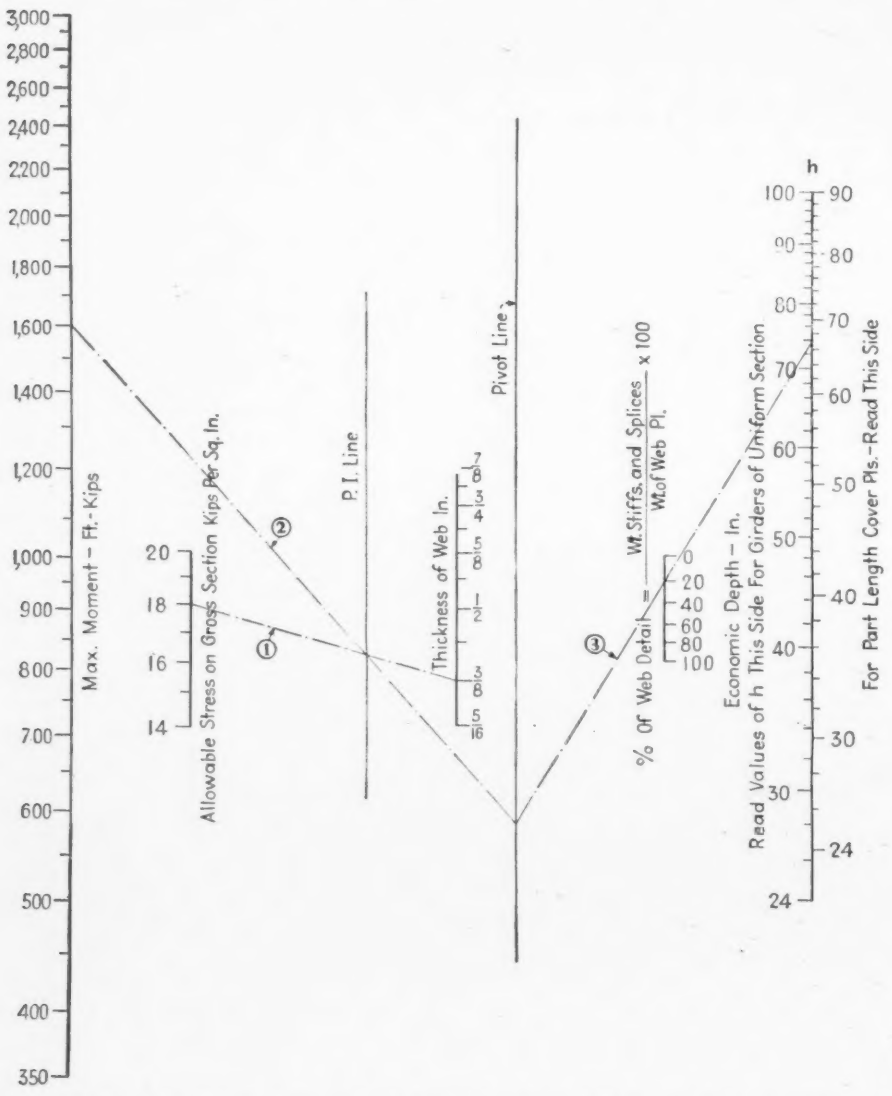
Under deck view of concrete wharf in which the tops of creosoted piles are embedded in the supporting beams.

From Field and Office

WORKING PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS

Chart Determines Economic Depth of Plate Girders

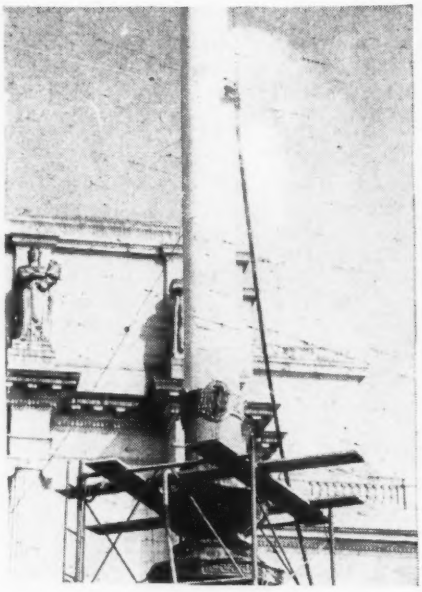
Use of the accompanying nomograph to find the economic depth of a plate girder is quickly illustrated by means of a typical example. Find the intersection on the P. I. line of a line through the allowable stress on gross section, 18 kips per sq. in., and web thickness, $\frac{3}{8}$ in. (line 1). Extend a line from the maximum moment, 1,600 ft.-kips, through this point of intersection (line 2) until it meets the pivot line. Then, swing it around (line 3) to pass through the assumed percent of web detail, 20 percent, and its intersection with the economic depth scale is 74 in. for a girder of uniform section and 67 in. for part-length cover plates.—B. L. PARKER, *Structural Engineer, Arthur G. McKee & Co., Cleveland, Ohio.*


Max. Moment – Ft.-Kips
Allowable Stress on Gross Section Kips Per Sq. In.
P. I. Line
Pivot Line
Thickness of Web In.
% Of Web Detail = Wt. Stiffs. and Splices / Wt. of Web Pl. x 100
Read Values of h This Side For Girders of Uniform Section
Economic Depth – In.
For Part Length Cover Pls.–Read This Side
h

Nomograph determines economic depth of plate girders. Typical example is solved, as indicated by lines 1, 2 and 3.

Steam-Cleaner for Flagpoles

Faced with the problem of cleaning three 92-ft. high flagpoles rapidly and cheaply, the Office of National Capital Parks, Washington, D. C., recently devised a simple piece of equipment to accomplish the task. The device, which produces a steam jet, is of metal covered with sponge rubber and is supplied with "vaporized" soap suds through a rubber hose. It is hoisted on the flag halyards.



National Park Service photo

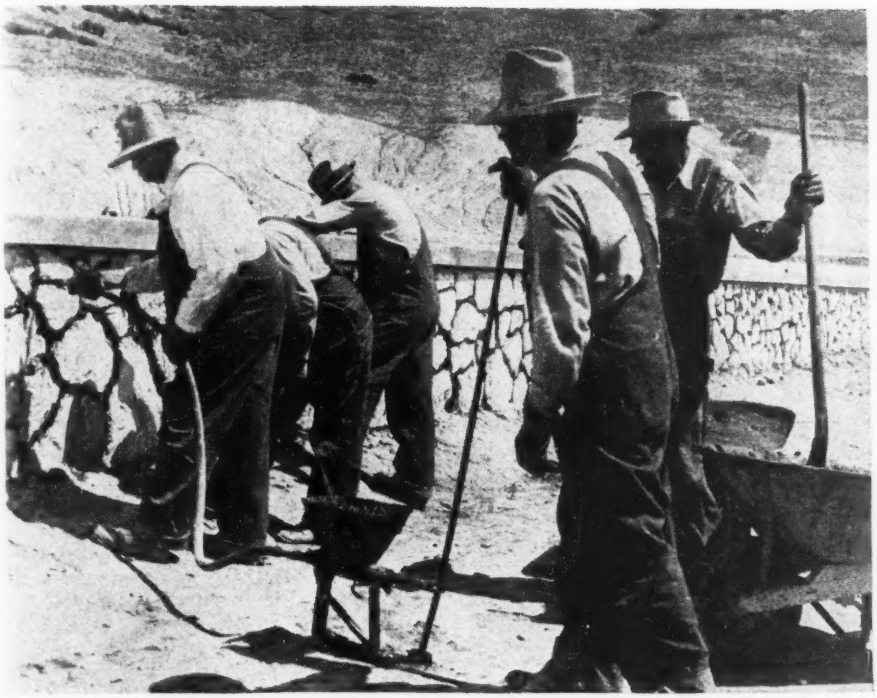
Sponge-covered metal device raised on halyards swabs high flagpoles with steam jet and soap suds.

Two men manipulate guy wires holding the jet in contact with the pole, swabbing it by a see-saw motion of the wires; a third raises and lowers the halyards. Steam is suplied by a commercial steam generator mounted on a truck.

All three poles, located in Washington's Union Station Plaza, were cleaned in one day with the steam sponge. Cost is said to be about $20 a pole as compared with a former cost of $1,500 for painting the three.

Mortar Placing Speeded With Job-Made Machine

To place a black mortar surface coat in the joints of the rock masonry parapet wall on the Newton Dam in Utah, workmen built on the job of scrap metal the special pump illus-



Job-built hand-operated pump forces black mortar through hose and small nozzle to point up the joints in masonry wall.

trated. Its use resulted in a large saving of both time and cost. The tool also produced a denser and better surface coat than could have been obtained by hand methods.

The wall was constructed by laying rocks in a sand-cement mortar, with the mortar kept back 2 to 3 in. from the wall surface. This permitted later placing of a black mortar surface coat.

The Newton Dam was built by the Bureau of Reclamation under the direction of I. Donald Jerman, construction engineer. The work on the parapet wall was accomplished under the general supervision of Engineer W. F. Peterson of the regional office at Salt Lake City. The tool was developed by E. J. Wick, engineer, and T. A. Brown, general foreman.

Platform for Removing Crane Rail

Through use of a specially constructed platform, renewal of over 6,000 ft. of crane rails 60 ft. above floor level was satisfactorily completed without accident in one of the buildings of the Glenn L. Martin Co., Middle River, Md.

The platform was 4 ft. wide and 60 ft. long and was supported on welded steel trusses. Since it was to be lifted into place by cranes that were hung from the rails, the center section was built-up several feet.

To overcome the danger of tipping under unsymmetrical loading, 1,500-lb. sliding counterweights were attached to the bottom. With the platform standing on the floor, the counterweights also rested on the ground but their suspension supports extended about 10 ft. into the air. As the platform was lifted, the counterbalances resting on the floor prevented it from swinging, and when the counterweights finally left the ground, they were suspended 10 ft. below the platform, effectively preventing tilting as the workmen moved about.

With the apparatus clamped to the old rail, a 50-ft. section of rail, weighing 1,250 lb., was removed and the platform and rail lowered to the floor. When the platform was again raised, it carried a section of new rail with it.

The apparatus was devised by C. M. Harvey, general foreman, his assistant, W. L. Dunsmore, and G. Edelman, millwright foreman, of the Maintenance Section, Glenn L. Martin Co.

Vertical Curve Corrections Simplified by Use of Slide Rule

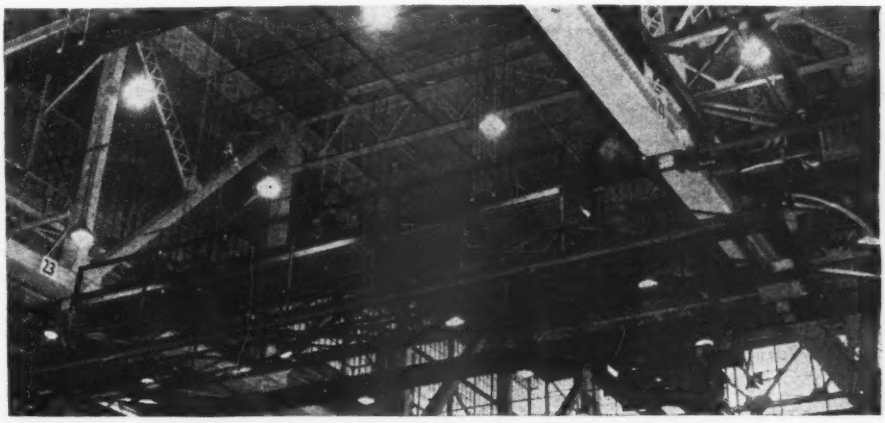
Corrections to be applied to grade elevations in order to obtain elevations on a parabolic vertical curve are usually worked out longhand, by approximations, or by machine, while the simplest tool for this work—the slide rule—is usually forgotten. A method of determining these corrections that has been employed for some time and found to be a considerable time saver besides being accurate to three significant figures is as follows:

1) Solve for the middle ordinate, g, by any of the standard textbook methods, then multiply by 4 to obtain $4g$, the factor needed for slide rule computation of all corrections sought.

2) Set the indicator at the length of the curve on the "D" scale, thus giving L^2 on the "A" scale.

3) Set the slide so that the value of $4g$ on the "B" scale coincides with the indicator (and with L^2).

4) Set the indicator to the required length, x, on the "D" scale. The correction for this distance appears under the indicator on the "B" scale—SAMUEL LECHNER, *Junior Civil Engineer, New York State Dept. of Public Works, Bronx, N. Y.*



Platform eliminated accidents in replacement of old crane rail 60 ft. above floor.

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Russian "Innovations"

Sir: The article on engineering construction in Russia, in your issue of May 16, 1946, appeared to me like carrying coal to Newcastle. It described some crude brick arches when we have had here the bold and elegant designs of Guastavino in the last 75 years. It told of a new method of design of reinforced concrete beams when this method was clearly described by me in the American Concrete Institute *Journal* of Dec., 1914, and in *Engineering and Contracting*, Aug. 11, 1915, p. 108. A discussion of mine in *ENR* April 30, 1936, p. 641, also clearly described this method.

Most recently the *Journal* of the Engineering Institute of Canada carried an article of mine showing clearly the deviation of concrete beams from that predicted by the "old theory."

L. J. MENSCH
Engineer and Contractor
Chicago, Ill.

Cutoffs in Levees

Sir: I have read with great interest the article by Brig. Gen. Hans Kramer on "Deep Cutoff Trench of Puddled Clay for Earth Dam and Levee Protection" (*ENR* June 27, vol. p. 986) and your editorial on the same subject. On the Mississippi River levee system, the need for greater control of seepage in both embankments and foundations has been recognized by engineers for some time. These controls are aptly stated by the author to be "keeping the water out but taking care of what gets by". His novel method of cutoff construction, aimed at keeping part of the water out, is partial fulfillment of the dreams of many levee engineers.

As stated by an experienced levee engineer several years ago to the writer, when he was working on similar schemes, "We were hopeful for the development of some substitute for steel sheetpiling in cut-off walls and very hopeful that the experiments would arrive at some tightening underground that would be a substitute for piling." The experiments referred to consisted of full scale field operations of attempting cutoff constructions by means of grouting. Although unsuccessful, these experiments did result in further studies of the possibility of utilizing trenching machines.

Of particular interest to the writer is the author's discussion of the merits of "a metal shield, integral and movable with the trench excavator, to brace the sides of the trench during the excavating and backfilling process".

During the earlier years (1938) of the Connecticut valley flood control projects, the writer proposed a somewhat similar scheme for construction of cutoffs beneath earth levess along the Connecticut and Westfield rivers in Massachusetts and Connecticut, the proposals and designs being based on the average conditions encountered in those valleys. Due to the very cohesionless character of the pervious sediments beneath the flood plains, a "cutoff constructor" was required which would not only excavate a deep trench, but would simultaneously place an impervious backfill within the trench. This was to be accomplished by means of a narrow shield and pressure chamber, integrally fabricated with the excavating boom, which was extended to reach a depth of 30 ft. A backfill, comprised of excavated materials from the trench rendered impervious by additions of clay or silt or any other impermeablizing material, was to be used and placed in such a manner that a continuous impervious cutoff wall of 28-in. and 18-in. width would be constructed in the undergound.

These schemes were reviewed by one of the larger manufacturers of trench digging equipment, and incorporated in a preliminary design, wherein their largest machine was adapted for the purpose.

These facts are stated here to record one other possible solution to cutoff constructions made by trench excavators, even under the most difficult foundation conditions.

The method of backfilling described in the article, is simple and direct, having been demonstrated as very practicable for the conditions encountered within the test section of valley. Whether or not this method is universally applicable is a matter of future development, which it is hoped the Army Engineers will investigate.

FRANK E. FAHLQUIST
Consulting Engineer and Geologist
Riverside, R. I.

Replanning European Cities

Sir: I read with interest that Szymour Sykus, associate director of reconstruction for the City of Warsaw, Poland, and his wife will come to the United States to study American practice (presumably in city planning) for guidance in the reconstruction of their own city (*ENR* June 20, vol. p. 951).

There is something about this that strikes me as strange. Either the Poles don't know what a terrible mess most of our cities are in and don't know that we're doing nothing particular about it, or else Mr. Sykus and his wife are coming for the ride.

It would seem that the field of town and city planning is on a definitely higher plane almost anywhere in Europe than it is in America. It would seem that this disparity in respective planes of planning in this field will long continue due to the reluctance of Americans in general to accept, not only town and city planning, but any kind of planning. They much prefer to permit what they naively term "free enterprise" to continue unchecked and to produce cities consisting of a business section surrounded by concentric rings of no man's land in varying degrees of deterioration with a final outer band of presently developing more or less high grade residential territory.

Knowing the state of minds of Europeans in general concerning the planning of the reconstruction of their cities and their universal acceptance of the idea of sound planning at a high level, it is perfectly reasonable to expect to find 20 years from now, that Europe's cities will have been rebuilt in accordance with well thought out plans, while America is still debating the basic proposition whether planning is necessary at all.

WALTER C. CAREY
New Orleans, La.

Book Notes and Reviews

The month's addition to the engineer's reading and reference list

Reinforced Concrete Practice

PROPOSED MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES—By Committee 315 of American Concrete Institute, New Center Building, Detroit 2, Mich., 55 pp., 35 illustrations, 9 tables. $2.50.

Prepared with the cooperation of the Concrete Reinforcing Steel Institute, the report has been approved by the Standards Committee of the American Concrete Institute as a proposed standard, and as soon as procedure permits, it will be submitted for final institute adoption as a full standard. It presents improved methods and standards for preparing drawings for the fabrication and placing of reinforcing steel.

Included are discussions of engineering drawings and "placing drawings," presenting drawing and fabricating-detail standards, marks, schedules and bar lists; fabricating shop practice, covering shop procedure, warehouse stock, tolerances and extras; welded wire fabric; accessories; and typical drawings to illustrate the use of the standards. The last includes recommended layout for drawings, splice details, composite construction details, standard column ties, typical bar bends, standard hook details and typical drawings of different types of concrete structures, such as flat-slab floors, circular tanks and rigid-frame buildings. In general, designs given meet the requirements of the ACI code. The tables contain data as to minimum beam widths, maximum spacing of column ties and maximum number of column bars.

Specifications and Costs

DATA BOOK FOR CIVIL ENGINEERS, Volume II, Specifications and Costs—By Elwyn E. Seelye. 325 pp. John Wiley & Sons, New York 16, N. Y.; Chapman & Hall, London, $6.75.

This publication is second in a three-volume series of data books with the following titles: Design (reviewed *ENR* Jan. 10, 1946, vol. p. 169), Specifications and Costs, and Field Practice—now in press. Specifications and Costs provides short form and comprehensive specifications for most building and heavy construction needs; a cost section that gives unit costs for practically all construction, and includes as an "extra dividend" a glossary of civil engineering and construction terms that should be most helpful to all those writing or working under specifications.

More than half of this large book is allotted to typical contract documents and specifications, with a long and short form frequently given, which can be used verbatim with addition of limiting local data. As the author recognizes, if other engineers want to use some of their own ideas, these can be fitted into the framework of the specifications.

In general, the use of specific tolerances rather than "first class workmanship" with references to ASTM and similar standards for brevity make this presentation one that offers much in convenience to the specification user. If demand warrants, these sheets will be made available in loose form on thin paper for reproduction.

Items covered include all usual structural requirements, airports, and roads, as well as complete specifications for sewage treatment and water plants.

The cost section of the book gives in brief form data on all items of building and heavy construction. By keying the single set of cost figures to the perpetually current *ENR* cost index and by providing a conversion table for several parts of the country, a large amount of cost information adequate for estimating is packed into the volume.

Municipal Data

THE MUNICIPAL YEAR BOOK: 1946—Edited by Clarence E. Ridley and Orin F. Nolting. 593 pp. International City Managers' Association, 1313 East 60 St., Chicago 37, Ill. $8.50.

Now in its thirteenth year of publication, The Municipal Year Book is once again the annual authoritative resume of activities and statistical data of American cities. The volume does not pretend to answer every question that might confront those vitally concerned with municipal affairs. Nevertheless, within this one book may be found thousands of pertinent facts and statistics on city activities.

Urban redevelopment, municipal airports, and off-street parking lots are some of the new topics in this edition. In this period of overhauling local ordinances, weeding out obsolete rules and regulations, and strengthening local powers, the Year Book section on model ordinances and references to information on service standards provides a rich source of easily tapped information. Also useful are sections containing data on important court decisions of 1945, and on cities levying sewer rentals and refuse collection charges.

Construction Contracts

LEGAL PHASES OF CONSTRUCTION CONTRACTS—First edition. By I. Vernon Werbin. 267 pp. McGraw-Hill Book Co., New York 18, N. Y., $2.75.

A book for contractors and for engineers concerned with interpreting and working under construction contracts and just as specifically for lawyers engaged in contract litigation. The book groups legal decisions affecting each of 46 construction contract problems in a separate chapter. Each is so written as to be readily understandable by the layman and yet adequate for the lawyer, full legal citations being included.

Among the major subjects covered are: extra work, engineers decisions, effect of acceptance of final payment on claims, extent of authority of contracting agent, mistakes in bid, ambiguous contracts and compulsory arbitration.

The book can well be a reference for use before litigation occurs as it outlines the judicial interpretation of construction contracts and thus gives disputants a workable idea of the attitude of the courts on what engineers put into contracts. In addition, the cases cited and decisions quoted are interesting enough to be good incidental reading.

Construction Safety

SURFACE CONSTRUCTION WITHOUT ACCIDENTS By H. Edgar Beaven, 84 pp., Engineering Department, American Mutual Liability Insurance Co., Boston 16, Mass.

Emphasizing elimination of causes of accidents on such jobs as earth moving, road building and small structures, this booklet, by American Mutual engineers, is planned as a reference for the

contractor, superintendent and foreman. Included are suggestions on rock excavation, first aid and how to protect the public on road jobs and detours.

A considerable portion of the book is devoted to methods of keeping payroll and cost records to assure minimum rate classifications and ease of auditing payrolls on surface construction jobs.

Water Compacts

INTERSTATE COMPACTS—Four volumes. Prepared by the Colorado Water Conservation Board, State Office Bldg, Denver 2. Limited edition (multigraphed).

Most large rivers are interstate in character. As a consequence, especially in the arid west, many controversies have arisen between states concerning the diversion and use of interstate waters, and much litigation has resulted. Out of the litigation have come interstate compacts or Supreme Court decisions that now set a pattern for future agreements.

The purpose of work of the Colorado Water Conservation Board is to bring together in convenient form a vast amount of information that heretofore was widely scattered. Volumes I and II are compilations of articles that have appeared in various law journals and elsewhere addresses and committee reports on interstate compacts; Volume III contains a statement on "Soverign Rights and Relations in the Control and Use of American Waters" by Ernest C. Carmen of the Los Angeles Bar; Volume IV contains other papers on apportionment of waters and on interstate compacts, the text of one of the major Supreme Court decisions relating to waters, copies of compacts entered into by Colorado, and a reference list.

Treatment of Water

WATER TREATMENT AND PURIFICATION—Second Edition. By William J. Ryan. 270 pp. McGraw-Hill Book Co., New York 18, and London. $2.75.

This second edition of a book crammed with working knowledge of various treatments used for removing impurities from water contains additional descriptions of processes that have come into use since the first edition was published in 1937. In this group are included: organic ion exchange materials for water softening, acid absorbents, equipment for demineralization, latest methods of boiler water treatment to prevent embrittlement, and stabilization to prevent scale deposition in pipelines and boilers.

Laws Affecting Airports

BUSINESS LAW OF AVIATION—By G. O. Dykstra and Lillian G. Dykstra. 523 pp. McGraw-Hill Book Co., New York 18. $5.

Municipal officials charged with building airports and engineers who design and select locations for airfields will find much of value to them in this book. For example, under the subject of trespass, the authors discuss the legal aspects of a matter of growing importance in many communities, the rights of owners of property adjoining an airfield to protection against the noise of planes approaching the field. Powers of municipalities in acquiring and operating airports are reviewed, as is the question of taxation.

Miscellaneous Notes on Booklets and Reprints

"Fire-Resistive Apartments Yield Better Income", a study of multiple-dwelling costs in New York City, prepared under the joint sponsorship of the Steel Joist Institute, American Institute of Steel Construction and American Iron and Steel Institute, compares the relative cost based on 1939 figures, of fire resistive and non-fire-resistive apartment buildings six stories in height. In addition to producing greater rental income, the report concludes, fire-resistive construction costs less per rentable room by amounts ranging up to 6.3 percent.

FOUR TECHNICAL BULLETINS issued recently by the American Road Builders Association, 1319 F St., N. W., Washington 4, D. C., contain reprints of papers presented at the January, 1946 meeting of the association: Economy of Consolidated Gravel Road Maintenance, and Use of Glacial Deposits in Highway Construction and Maintenance, Technical Bulletin 98; The Value of Stabilized Roads in the Highway Program, and Where the Stabilized Road Belongs in the County Highway Program, Technical Bulletin 99; Traffic Deaths, a Challenge to the Highway Industry, Technical Bulletin 101; Pumping of Subgrade Through Paving Joints and Cracks, The Design and Maintenance of 1½ Million Square Yards of Paving Slab to Prevent Pumping of Subgrade Through Paving Joints, and The Necessity of Prompt and Continuous Maintenance. Technical Bulletin 103.

THE ENGINEER IN THE SMALL COMMUNITY is the subject of one short chapter in a pamphlet entitled "A Business of My Own", written by Arthur E. Morgan, former head of the Tennessee Valley Authority, in which Mr. Morgan discusses the opportunities for occupations and industries in small communities. Outlined in this chapter are means by which civil, mechanical, electrical, chemical and mining engineers with little or no capital can set up businesses of their own in small towns and cities. Also included is some comment about the course to be followed by young engineers who are interested in sociology. Copies of the pamphlet may be obtained from Community Service, Inc., Yellow Springs, Ohio. $1.

TO AID TOWNS interested in building small airfields, the Missouri State Department of Resources and Development has issued a pamphlet entitled "Model Airpark". This is an account of how the town of Eldon, Mo., financed and built an "airpark," which is defined as "a conveniently located, attractively landscaped, small airport usually consisting of two sod flight strips and designed to accommodate the personal plane user and non-scheduled commercial aviation activities." Copies may be obtained from the Department at Jefferson City, Mo.

New Engineering Books

HOUSING AND CITIZENSHIP: A Study of Low-Cost Housing—By George Herbert Gray. 254 pp. Reinhold Publishing Co., New York 18. $7.50.

THE MUNICIPAL YEAR BOOK: 1946—593 pp. The International City Managers Association, 1313 East 60th St., Chicago. $8.50.

A DICTIONARY OF INSURANCE TERMS: How to Understand Insurance and Buy It Intelligently—66 pp. Employers Mutual Liability Insurance Company of Wisconsin, Wausau, Wis. Limited free distribution.

ENGINEERING MECHANICS—Second Edition. By Seibert Fairman and Chester S. Cutshall. 267 pp. John Wiley & Sons, New York 16; Chapman & Hall, London. $3.

(*Continued on p.* 120)

SCHRAMM'S COME *ALL* SIZES!

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MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

In August, CAST IRON PIPE increased $4 per ton in all cities. Other nation-wide increases were a jump of $1.75 per 100 lb. for WHITE LEAD and a rise of $1.25 for RED LEAD. CEMENT, AGGREGATE and READY-MIXED CONCRETE also had widespread increases. Cement rose from $.02 to $.20 per bbl. in Baltimore, Cincinnati, Detroit, Kansas City, Cleveland, New York, and Birmingham. Price rises for Sand, ranging from $.08 to $.80 per ton occurred in Baltimore, Birmingham, Chicago, Cleveland, Detroit and Kansas City. Ready-mixed concrete jumped as much as $.95 per cu. yd. in Baltimore. STRUCTURAL CLAY TILE, BRICK and LIME also showed decided increases. Structural clay tile, 3x12x12 had price rises ranging from $4.50 to $11.00 per M lots in Birmingham, Cincinnati, New York and San Francisco. The greatest increase in price of common brick was $5.25 per M at Cincinnati. VITRIFIED SEWER PIPE rose in Cincinnati, Detroit, Kansas City and New York. LUMBER prices were erratic, gaining as much as 35 percent in some cities and remaining constant in others.

CEMENT, AGGREGATE, READY-MIXED CONCRETE—F. O. B. CITY

	PORTLAND CEMENT — Per bbl., C/L lots, incl. 40c. per bbl. for bags, cash dis. not deducted			SAND AND GRAVEL — Per ton, carload lots			CRUSHED STONE — Per ton, carload lots, f.o.b. plant		CRUSHED SLAG — Per ton, carload lots, f.o.b. plant		CONCRETE BLOCK — 8x8x16-in.: truckload del.: per block		CONCRETE READY MIXED — truckload 1:2:4, over 50 c.y., del.
	Cloth *a*	Paper	Bulk	Gravel, 1½ in	Gravel, ¾ in	Sand	1½ in	¾ in.	1½ in.	¾ in	Sand-grav	Lt.wgt. Agg.	
Atlanta	$2.77	$2.52	$2.43	$1.79	$1.89	$1.65	$1.79	$1.89	$1.59	$1.69	$0.17	....	$9.00
Baltimore	2.70*a*	2.45*a*	2.20*a*	2.05‡	2.05‡	1.55‡	2.00‡	2.00‡	2.00‡	2.00‡	.145	$0.145*w*	8.00
Birmingham	2.70	2.45	.....	2.00	2.00	1.59	2.50	2.50	.90	1.15	.1425	....	6.90
Boston	2.97*b*	2.72*b*	2.52	1.50‡	1.50‡	1.40‡	1.25	1.35	....	....	.13	.155*w*	7.90*m*
Chicago	2.92	2.67	2.52	2.23‡*d*	2.23‡*d*	2.23‡*d*	2.15‡*d*	2.15‡*d*	1.75‡	1.75‡	.195	.195*x*	....
Cincinnati	2.59	2.34	2.14	1.20	1.20	1.10	1.80	1.80	....	....	.15	.18*w*	7.45
Cleveland	2.63	2.38	2.23	1.75*i*	1.75*i*	1.40/2.05*i*	1.95*i*	1.95*i*	1.30	1.30	.14	.14	8.65
Dallas	2.51	2.26	2.06	1.80	1.80	1.45	1.72	1.82	....	....	.0875*p*	....	8.20
Denver	3.59	2.92	2.47	1.20	1.25	.90	1.65	1.75	1.00	1.00	....	.155	8.75
Detroit	2.61	2.36	2.18	2.65	2.65	2.35	2.25	2.25	2.00‡	2.00‡	.16	.17*w*	7.69
Kansas City	2.80	2.60	....	2.00	....	1.40	2.00	2.00	---	---	.16	.16*wy*	8.50*n*
Los Angeles	3.10*r*	2.50*r*	....	1.50	1.50	1.35	1.50*f*	1.50*f*	---	---	.125*bb*	.125*bb*	9.26*m*
Minneapolis	3.44*dd*‡	3.19*dd*‡	....	1.00*h*	1.00*h*	.25*h*	1.00*h*	1.00*h*	....	....	.183*ff*	....	7.60*j*
Montreal	....	1.95*r*	1.79*r*	1.65‡*s*	1.65‡*s*	1.50*t*	.80*ct*	.90*ct*	....	....	.1924	....	7.00*ls*
New Orleans	2.41	2.16	1.92	1.67	1.65	1.21	....	....	.90	1.15	.23	....	9.25
New York	3.08‡	2.88‡	....	1.74*deu*	1.74*deu*	1.07*eee*	1.80*de*	1.80*de*	....	....	.16	.14*ucc*	8.25*kq*
Philadelphia	2.75‡	2.50‡	2.30‡	1.55‡	1.65‡	1.20‡	1.90‡	1.95‡	1.10	1.10	.155	.155*w*	8.55
Pittsburgh	2.80	2.55	2.35	1.85‡	1.85‡	2.15‡	2.35‡	2.35‡	1.80	1.80	.21	.21*z*	9.15
St. Louis	3.08*o*	2.80*o*	....	1.75‡*o*	1.75‡*o*	1.65/1.75‡*o*	1.25/1.95	1.25/1.95	.90*y*	1.15*y*	.175	.20*yo*	8.70
San Francisco	2.81	2.21	1.91	1.36	1.36	1.36	1.46	....	....	....	....	.23*y*	7.55
Seattle	....	2.75*o*	....	2.35‡*d*	2.35‡*d*	2.35‡*d*	2.85‡*od*	2.85‡*od*	....	....	.16	....	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c per bbl off for cash. *c* F.o.b. quarry. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount of 2 percent for cash in 10 days. *l* 2000 lb. concrete. *m* 50c off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 5½ x 8 x 12 in. *q* 5 cu. yds. or more. *r* 10c. per bbl. off cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u* In outlying New York districts, price is $1.89. *v* 20c. per bbl. discount; 80c. per bbl. for bags. *w* Cinder. *x* Waylite. *y* Haydite. *z* Celocrete. *aa* Pumice. *bb* 6 x 8 x 12 in. *cc* Also 8 x 18 in. *dd* Prices quoted are LCL. Carload lots not available. *ee* In outlying New York districts, price is $1.22. *ff* 8 x 8 x 18 in.

CASH DISCOUNTS CEMENT to Contractors: truck delivery 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c per bbl for payment within 15 days of date of invoice. Subject discount 10c per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICE BASES AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c per bbl; 10c refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind.	$1.90	$1.85	Ironton, Ohio	$1.80*	$1.75*	Universal, Pa.	1.85	1.80
Hannibal, Mo.	1.90	1.85	Northampton, Pa.	1.75	1.70	Waco, Tex. (Plus 9c tax in Tex.)	1.75	1.70
Independence, Kans.	1.90	1.85	Richard City, Tenn.	$2.00	$1.95	Montreal City (Discount 10c. per bbl. 20 days)	1.68	1.67
			Steelton, Minn.	2.00	1.95			

* Destination price base: effective Sept. 17, 1945

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS—F. O. B. CITY

	PAVING BRICK AND BLOCK			PAVING ASPHALT — Per ton, less than 80 penetration		ASPHALT BINDERS—FLUXES — Per gal., 80–300 penetration		CUTBACK ASPHALT — Per ton		ROAD OIL — Per gal.	ASPHALT EMULSION (Quick-breaking) — Per gal	
	Granite per M lots of 50,000 4x4x8 in	Brick per M 3x4x8½ in carload lots	Wood per sq. yd. 3½ in 16-lb. treat	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$35.00	$2.25	14.00	.....	$0.0.74	.....	$0.0806*h*	.....	$0.0781	$0.0806	.....
Baltimore	150.00‡	52.70	85.00*m*	15.00*r*	21.00*r*	.06*r*	0.09*r*	13.00*r*	23.00*r*	.06*r*	.07*r*	.14*r*
Birmingham	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Boston	85.00	59.00	3.75	16.00	25.00	.0675	.12	18.00	31.00	.0675	.0875	.15
Chicago	150.00‡	65.00/68.00*e*‡	2.85/4.00*d*	15.00	23.50	14.15*g*	22.65*g*	.0625*h*	.155*h*	.05	.09/.10‡	.13/.15‡
Cincinnati	125.00	66.90	.....	17.00	.....	.085	.....	12.25	.....	.07	.085	.....
Cleveland	127.50	39.00	3.87	17.00	19.00	.085	.085	.10*h*	.11	.08	.....	.....
Dallas	.....	40.00	.....	15.36	22.70	.0618	.12	17.95	28.00	.06	.0725	.135
Denver	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	75.00*t*	.....	17.60*f*	26.56*f*	.0734	.128	.0718*h*	.119*h*	.067	.0974	.135
Kansas City	.....	45.00	.....	15.00*u*	20.60*u*	15.60*g*	.....	.07*h*	.0675*hu*	.....	.11	.15*u*
Los Angeles	.....	50.00	.....	9.00*b*	23.00*b*	9.50*bg*	24.00*bg*	9.50*bg*	.....	.03*b*	.08*b*	.16*b*
Minneapolis	.....	.....	2.017*d*	.....	.....	.....	.....	.....	.....	.....	.....	.....
Montreal	70.00	.....	.....	16.60*k*	24.25*k*	.1035*k*	111*k*	.115*hk*	.135*hk*	.08*k*	.135*k*	.188*k*
New Orleans	.....	.....	.....	13.00*a*	.....*s*	12.00*g*	.....*s*	5.75	.....*s*	.05	.....	.....
New York	.....	.....	2.70	18.64	28.49*s*	.0735*t*	29.44*g*	.0751*h*	.1256*h*	.0678	.0763	.1292
Philadelphia	150.00	62.00	4.06	16.00	.....	15.00	.....	.0675*h*	.....	.....	14.00*gr*	.....
Pittsburgh	135.00	39.75	3.90	19.00	25.00	.095	.17	21.00	32.00	.075	.085	.14
St. Louis	.....	42.00	.....	14.80	19.80	13.80*g*	18.80*g*	.0587*h*	.1362*h*	.483	.07	.1215
San Francisco	.....	47.75*c*	.....	11.75	21.00	11.75*g*	.....	13.75	.....	.....	.0525	.1125
Seattle	.....	.....	.....	11.75*i*	22.75*i*	9.50	21.20*gi*	12.25*i*	14.75	11.75*i*	.0525*i*	.0625*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* F.o.b. Refinery. *c* 2½ × 8½ × 4 in. *d* 2-in. interior block, 6-lb. treatment. *e* 3½ × 4 × 8½. *f* Mexican. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3 x 3½ x 8½ in. *k* Tax included. *l* Quoted on request only. *m* Per thousand. *n* Drums not available. *r* February 1943 prices, none later available. *t* Very scarce. Truck deliveries in small quantities.

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Extra bruise resistance is built into these tires that float—yet grip

TIME was when bogs were bogeys for construction men working in soft dirt, sand and loam — conditions often met in building roads, dams, levees, airports. Tires would mire. When wheels would spin, tires might be cut by sharp rocks. Added injuries came when the tires hit rocks and ruts. These hits were shocks to the tire's heart—impacts leading to bruises, ply separation and blow-outs. Tire life, and job profits, were shortened.

But these tire headaches were just the kinds that B. F. Goodrich engineers could cure. They analyzed every angle, designed a new tire with special features . . . the Super Traction (shown above). The bogging down problem was solved with a special self-cleaning tread with enlarged contact area to provide maximum flotation. The tire stays on top, yet the big, heavy cleats take a deep, broad bite. There's *plenty* of traction for heavy pulling and big yardage.

Then, extra bruise-resistance was built into the tough Super Traction with a new construction principle — the *shock shield.* This shield is a set of four breakers — layers of rubber-coated rayon cords — between the tread and the plies. The breakers are in pairs, with the cords in each pair running parallel to each other — but with each pair running in opposite directions to give balanced strength. The breakers are cushioned with thick layers of shock-resistant rubber.

Under impact, the cords in the breakers stretch together — *not* across each other — and return to their original position. The blow is *distributed* and *absorbed* by the rubber cushions. Any shocks passed on to the cord body are greatly reduced.

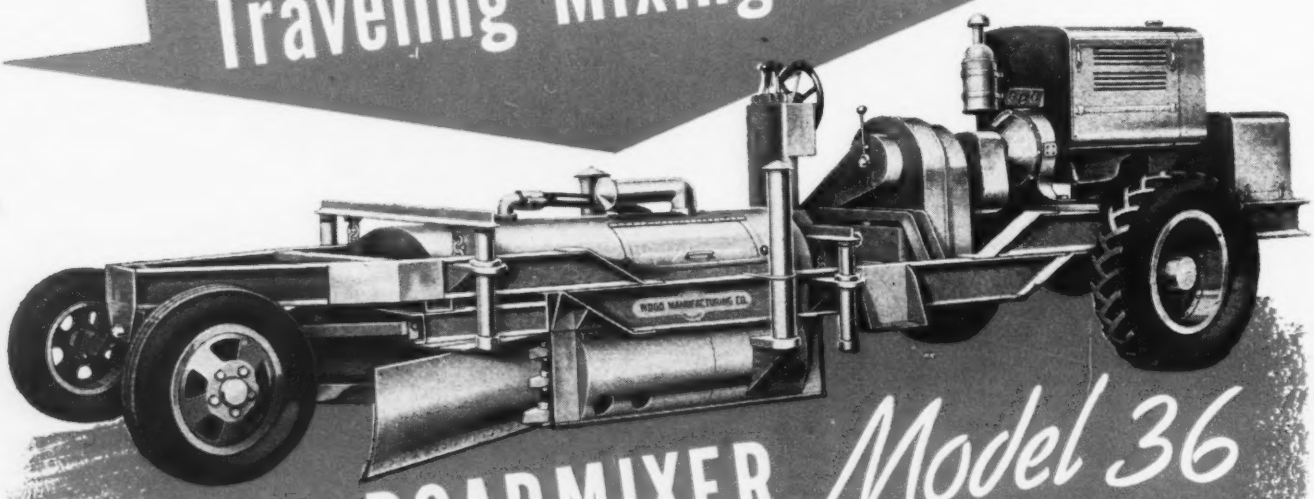
Shock-shield protected Super Tractions, and other B. F. Goodrich off-the-road tires are making big savings for users. They report fewer bruises, far less ply separation, better traction, longer wear. Users' own records show cases where tire life has been more than *doubled.* Let these tires make similar savings for *you.* See the B. F. Goodrich dealer, or write to us direct. *The B.F. Goodrich Company, Akron, Ohio.*

Truck Tires BY

B.F. Goodrich

Now!

A Lower Cost, Self-Propelled Traveling Mixing Plant



WOOD ROADMIXER *Model 36*

As easy to operate and maneuver as a motor patrol. Made to order for such small jobs as shoulders, stock piles, parking areas, and detours, yet plenty of capacity for any size job. Handles road oil, cut-back, tar, emulsion, and soil-cement mixes. Uses native or imported materials and produces 100 to 150 tons per hour of ready-to-spread mix.

In fact, the Model 36 incorporates all of the proved features of the famous Wood Roadmixers, Models 48 and 54, plus maneuverability, speed, and self-propulsion.

Get all the facts on this sensational new self-propelled Roadmixer today. See your local Wood Roadmixer dealer or write direct to the Wood Manufacturing Company.

Ask for Bulletin Thirty-Six

Facts

Rubber Tire Mounted—One-Man Operated—Five forward and five reverse road speeds, 2 to 14 miles per hour, for self-transportation to and from jobs—Five mixing speeds 11.5 to 71 feet per minute—Will handle 4 cu. ft. windrows—Power controls—Super traction for soft subgrade—Ample power for all operations.

1-36

ROADBUILDING EQUIPMENT

WOOD MANUFACTURING CO.

BOX 620, 6900 TUJUNGA AVE. • NORTH HOLLYWOOD, CALIF.

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¼-in. billet *b*	RIVETS ½-in structural	WIRE NAILS Base	SHEET PILING Base	STEEL RAILS Per Net Ton Standard	STEEL RAILS Per Net Ton Light	STEEL RAILS Per Net Ton Re-rolled	TRACK SUPPLIES Angle Bars	TRACK SUPPLIES Std Spikes *c*	TRACK SUPPLIES Tie Plates *c*	TRACK SUPPLIES Track Bolts
Birmingham	$2.35	$2.35	$3.75	$3.25	....	$43.39	$49.18	$48.29	$2.70	$3.65	$2.55	$4.75
Chicago	2.35	2.35	3.75	3.25	$2.65	43.39	49.18	48.29	2.85	3.65	2.55	4.75
Pittsburgh	2.35	2.35	3.75	3.25	2.65	43.39	49.18	48.29	2.85	3.65	2.55	4.75
Buffalo	2.35	2.35	....	....	2.65	.....	.....	.....	....	....	2.55	....
Cleveland	....	2.35	3.75	3.25	....	.....	.....	.....	....	....	....	....
Youngstown	....	2.35	....	....	....	.....	.....	.....	....	3.65	....	....
Detroit	....	2.45‡	....	....	....	.....	.....	.....	....	....	....	....
Gulf ports	2.60*a*	2.70*a*	....	....	2.85*a*	.....	.....	.....	....	....	....	....
Pacific ports	3.00*a*	2.75*a*	....	3.75*a*	3.20*a*	.....	.....	.....	....	3.90	2.70	....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates alone. Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per cl.

IRON AND STEEL PRODUCTS—F. O. B. WAREHOUSE, PER 100 LBS., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS*g* Per 100 lb., ¼ in., base price 15 tons or over *b* New billet	REINFORCING BARS*g* Rail steel	REINFORCING BARS*g* Add Switch	REINFORCING BARS*g* $/cwt. for Del.	EXPANDED METAL LATH Per 100 sq. yd., carload lots Std. diamond mesh. 3.4 lb.	EXPANDED METAL LATH Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 sq. ft., carload lots 4x16 in., No. 5 & 10 wires	WELDED FABRIC REINFORCING 4x12 in., No. 8 & 12 wires	WELDED FABRIC REINFORCING 6x6 in. No. 6 & 6 wires Per 100 s. f.	SHEET PILING Per 100 lb. base price
Atlanta	$4.05‡	$4.12‡	$4.12‡	$.025	$.10	$23.16	$25.30	$1.95	$1.45	$2.05	$3.35
Baltimore	3.909	3.344	....	....	.10	24.50	26.50	1.83	1.37	1.93	3.25
Birmingham	.....	.....	....	....	.10	19.00	21.00	1.93	1.44	2.03	....
Boston	4.162‡	4.194‡	2.97*c*	$20 C.L.	.10	18.50	20.50	1.89	1.41	1.98	3.02
Chicago	2.35*a*	2.35*a*	2.35*a*	.03	.05	22.50‡	24.50	1.80	1.35	1.89	2.65
Cincinnati	3.841	2.86*cd*	2.86*cd*	....	.05	....*n*	....*n*	1.79	1.35	1.88	....
Cleveland	3.838	4.00	3.98	.025	.10	20.50	24.50	1.79	1.35	1.88	...
Dallas	5.25	4.17	4.17	...	...	25.50	27.50	2.06	1.52	2.17	...
Denver	4.83	4.54	...	...	...	35.00	35.00	2.10	1.55	2.21	...
Detroit	3.952‡	3.14‡	3.14‡	...	.10	38.00‡	41.00‡	1.81	1.36	1.90	2.95
Kansas City	4.44	2.75*cd*	2.75*cd*	.0	.05	29.50	31.50	1.91	1.43	2.01	3.062
Los Angeles	4.45*f*	3.025	2.875	.03	.05	23.00	27.50	2.06	1.52	2.17	4.45
Minneapolis	4.142‡	2.99	2.99	.0	.10	25.00	27.00	1.93	1.44	2.03	3.06*d*
Montreal	3.95*i*	3.25*i*	3.15*i*	...	...	31.00*hi*	46.00*hi*	2.89	3.54*i*	2.96*im*	....
New Orleans	4.408‡	3.84	4.108	.05	.10	22.00	24.00	1.95	1.45	2.05	3.125
New York	4.008	2.96*e*	2.96*e*	...	.15	17.50	19.50	1.85	1.39	1.95	2.74
Philadelphia	3.937	3.899	....	...	...	20.50‡	22.50‡	1.84	1.38	1.93	2.97
Pittsburgh	2.35*a*	2.35*a*	2.35*a*	.025	.10	23.00	26.50	1.72	1.30	1.81	2.65
St. Louis	3.401	2.96	2.96	.0	.05	28.00	34.00	1.82	1.37	1.92	....
San Francisco	4.40	3.025	2.875	.025	.10	28.00	31.50	2.06	1.52	2.17	3.30
Seattle	3.00*e*	3.00*e*	....	....	....	43.50	44.00	2.06	1.52	2.17	3.20*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *m* Per sq. yd. *n* Practically no carloads are available. Retail price delivered is $27.00 for std. diamond mesh and $29.00 for std. ribbed.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in. *a*	VITRIFIED SEWER PIPE Per foot, std. 8 in., s.s.	VITRIFIED SEWER PIPE Delivered std. 12 in., s.s.	VITRIFIED SEWER PIPE ASTM C13-35 24 in.	VITRIFIED SEWER PIPE C13-35 36 in.	CLAY DRAIN TILE Per 1 000 ft., carload lots, f.o.b. 6 in.	CLAY DRAIN TILE 8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM C 14-35 12 in.	CONCRETE SEWER PIPE 24 in.	WROUGHT STEEL PIPE Full standard weight, *k* 1 to 3 in., Butt Weld Black %	1 to 3 in., Butt Weld Galv %	3½ to 6 in., Lap Weld Black %	3½ to 6 in., Lap Weld Galv. %
Atlanta	$65.40	$0.43	$0.67	$3.39	....	$110.00	$140.00	$0.45	$2.00	65.5	54.5	63.5	53.0
Baltimore	69.80	.35	.60	2.70	$7.25	160.00	200.00	.85	2.25	65.5	57.5	63.0	54.5
Birmingham	61.00	.275	.495	1.95	5.50	100.00	220.00	.50	1.75	....	....	....	....
Boston	72.00	.392*r*	.756*r*	3.15*r*	7.995*r*	170.00‡*r*	265.00‡*r*	.53	2.04	....	....	....	....
Chicago	69.80	.44	.85	3.37	7.00	110.00‡	150.00‡	.45	1.85	63.0	52.0	61.5	50.0
Cincinnati	68.80	.327	.6345	3.735	10.04	98.70	151.60	.36	1.60	51.5	39.4	51.4	36.0
Cleveland	70.20	.226*r*	.513	2.15	5.535	138.50	216.60	.36	1.60	68.5	57.5	66.0	54.5
Dallas	71.78	.365	.657	2.664	6.00	108.00	130.00	.46	1.75	65.5	54.5	63.0	51.5
Denver	76.62	.34	612	2.52	....	154.00‡	264.00‡	.52	2.00	44.0*s*	30.25*s*	40.5*t*	25.25*t*
Detroit	70.20	.455	8.775	3.375	8.50	170.00‡*r*	263.00‡*r*	.40	1.75	54.1	40.3	50.9	36.5
Kansas City	71.12	.38	.64	2.40	6.70	170.00	308.00	.45	1.60	60.5	49.5	57.8	46.3
Los Angeles	86.00	.36†	.648†	2.988	7.47	130.50	217.50	1.25	2.50	....	....	....	....
Minneapolis	73.10	.36†*x*	.75†*x*	2.645†*x*	....	....	....	.90	2.40	60.6	49.6	57.9	46.4
Montreal	74.00	.85*o*	1.50*o*	5.25*p*	8.50*ep*	45.00*m*	64.00*m*	.811*m*	2.51*m*	....	....	....	....
New Orleans	67.40	.31	.558	3.558	....	112.00	....	....	....	58.8	47.8	56.3	44.8
New York	69.20	.49	.94	3.80	9.16	....	....	.60	1.40	65.5	54.5	69.0	51.5
Philadelphia	67.90	.40	.7735	3.20	8.50	200.00	275.00	.80	2.15	52.75	39.01	49.63	35.25
Pittsburgh	70.60	.322†*r*	.631†*r*	2.7†*r*	6.625*r*	124.20	193.80	.99	2.25*q*	65.5*i*	54.5*i*	63.0*i*	51.5*i*
St. Louis	68.40	.31*w*	.558*w*	2.232*w*	4.95*w*	93.50*w*	187.00*w*	1.00*j*	2.15*k*	64.5*s*	53.5*s*	63.0*t*	51.5*t*
San Francisco	83.00	.3875*d*	.6975*d*	2.79	6.975	124.50	207.50	.58	2.34	....	....	....	....
Seattle	84.80	.4125	.77	2.98	....	....	....	.51*f*	1.44*f*	....	....	....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier. C/L lots. Burlington, N. J. (base) $59.00. Based on existing freight rates; subject to rate change. Gas pipe and class A $3 per ton additional. 4 in., $5 per ton additional, 30 in. and larger usually $1 per ton less. *b* Double strength. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¾ in., 8½c.; 1 in., 11½c.; 1¼ in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92; 3 per cent tax on transportation costs not included. *i* Applies also at Lorain, Ohio mills. Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv. 14½; 4½ in.: to 8 in. black, 32½, galv. 17. *j* Reinforced; spec. C 76-37. *k* Reinforced; spec. C 75-37. *m* Centri spun. *o* Less 50%. *p* Less 53%. *r* Truck delivery. *s* Gary base. *t* Morain base. *w* Less 3% for cash. *x* Price previously quoted was for carload lots. Since carload lots are not available at this time, listed price is based on LCL (no minimum).

LUMBER, TIMBER, PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

SHORT LEAF YELLOW PINE AND DOUGLAS FIR

All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face)
All Fir planks No.2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)

	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 Rgh	6x12 Rgh	12x12 Rgh
Atlanta	**$45.25**	**$45.25**	**$42.25**	**$41.75**	**$42.75**	**$45.25**	.....	.....	.....
	62.50	*62.50*	*61.00*	*61.00*	*60.00*	*60.00*	*54.00*	*58.50*	*52.50*
Baltimore	**72.50**	**74.00**	**69.50**	**69.00**	**69.00**	**75.00**	**$85.00**	.....	.....
	79.00	*80.00*	*78.50*	*72.00*	*77.00*	*78.00*	*92.00*	*$85.00*	*$83.00*
Birmingham	.....	.....	.....	.....	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....	.....	.....	.....	.....
Boston	**69.00**[1]	**71.00**[1]	**65.25**[1]	**67.25**[1]	**69.25**[1]	**73.25**[1]	**69.00**[1]	.....	.....
	63.50	*63.50*	*61.50*	*62.00*	*61.50*	*61.50*	*59.00*	*58.00*	*58.00*
Chicago ‡	**65.00**	**66.00**	**62.00**	**62.00**	**62.00**	**69.00**	**75.00**	.....	.....
	65.50	*65.50*	*65.50*	*65.50*	*65.50*	*66.50*	*67.50*	*63.00*	*64.00*
Cincinnati	**51 00**	**52 50**	**46.00**	**46.00**	**48.00**	**56 00**	**70.50**	.....	.....
Cleveland	**58.50**	**58.50**	**56.50**	**55.50**	**56.25**	**58.25**	**65.00**	.....	.....
	64.50	*64.50*	*58.50*	*54.50*	*54.50*	*55.75*	*68.75*	*58.75*	*57.75*
Dallas	**54.50**	**54.50**	**52.75**	**51.75***j*	**52.25**	**54.00**	**56.50**	**59.50**	**59.50**
Denver ‡	**64.25**[1]	**64.25**[1]	**64.75**[1]	**65.25**[1]	**63.75**[1]	**64.75**[1]	**68.75**[1]	*72.00*	*72.25*
Detroit	**82.00**	**82.00**	**79.00**	**79.00**	**79.00**	**85.00**	**92.00**	.....	.....
	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*	.....*j*
Kansas City *a*	**76.00**	**76.00**	**74.00**	**72.75**	**73.25**	**76.00**	**95.00**	.....	.....
	78.00	*78.00*	*77.50*	*77.50*	*75.50*	*77.00*	*75.00*	*95.00*	*95.00*
Los Angeles *a*	*64.75*	*64.75*	*68.50*	*67.25*	*67.25*	*67.25*	*76.00*	*75.25*	*73.50*
Minneapolis ‡*b*	**78.50**[6]	**77.25**[6]	.....	.....	.....	.....	.....	.....	.....
‡	*84.00*	*84.00*	*78.25*	*78.50*	*77.25*	*79.00*	*73.25*	*77.25*	*76.25*
Montreal *e*[7]	**69.00**	**70.00**	**64.00**	**68.00**	**70.00**	**75.00**	.....	.....	.....
	97.00	*97.00*	*97.00*	*97.00*	*97.00*	*97.00*	*87.00*	*87.00*	*87.00*
New Orleans	**42.00**	**42.00**	**39.00**	**38.50**	**34.00**	**42.00**	**46.00**	.....	.....
	36.00	*36.00*	*34.50*	*34.50*	*33.50*	*33.50*	*33.00*	*29.50*	*29.50*
New York ‡	**Range from $85.00 to $95.00**						**$95 to $100**	.....	.....
‡	*Range from $91 to $121*								
Philadelphia	**85.00**	**85.00**	**85.00**	**85.00**	**85.00**	**85.00**	**85.00**	.....	.....
	90.00	*90.50*	*90.00*	*90.00*	*90.00*	*90.00*	*90.00*	*100.00*	*100.00*
Pittsburgh	**55.40**	**57.80**	**67.35**	**59 60**	**65.45**	**67.10**	**80.85**	.....	.....
	73.60	*72.70*	*70.70*	*69.90*	*69.80*	*70.35*	*87.35*	*92.85*	*92.85*
St. Louis	**110 00**	**110 00**	**110.00**	**105 00**	**105.00**	**110.00**	**110.00**	*115.00*	*115.00*
San Francisco *d*	*66.00*	*66.00*	*62.25*	*62.25*	*61.25*	*61.25*	*56.00*	*55.00*	*55.00*
Seattle	*50.00a*	*50.00a*	*52.25a*	*52.25a*	*51.00a*	*51.00a*	*50.75a*	*52.75a*	*57.75a*

	LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment (See note for base price)	
	2x12 Rgh	12x12 Rgh	⅜"	¾"
Atlanta	$67.00	$67.00	$17.72	$21.37
Baltimore	181.00	175.00	18.45	21.995
Birmingham	.....	.....	17.245	20.795
Boston	.....	.....	18.195	21.995
Chicago ‡	97.00	97.00	14.555	17.555
Cincinnati	68.50	68.50	17.245	20.795
Cleveland	.....	91.75	17.615	21.265
Dallas	89.75	86.00	14.555	17.555
Denver ‡	.....	.....	10.285	12.435
Detroit	91.00	105.00	17.245	20.795
Kansas City *a*	95.00	100.00	12.605	15.205
Los Angeles *a*	.....	.....	9.81*gh*	11.86*gh*
Minneapolis ‡*b*	.....	.....	13.765	16.615
‡	.....	.....	.....	.....
Montreal *e*[7]	.20*i*	.20*i*	.....	.....
New Orleans	54.50	69.00	14.555	17.555
New York ‡	125.00*f*	130.00*f*	18.195	21.995
‡	.....	.....	.....	.....
Philadelphia	140.00	140.00	18.195	21.995
Pittsburgh	126.00	137.00	17.88	21.68
St. Louis	110.00	110.00	14.555	17.555
San Francisco *d*	.....	.....	7.33*g*	8.83*g*
Seattle	.....	.....	.....	.....

Bold Face type. Southern Pine *Italics, Douglas Fir* [1] Long leaf [2] Roofers N. C. Pine [3] Spruce [4] Native [6] Western Pine, No 3 Common [7] Spruce. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *c* 5M ft. or less. *d* New series-sales through wholesale distribution yard (F.o.b. purchaser's truck or carrier, San Francisco paid). For relation to mill prices formerly carried, see Lumber price report ENR (Vol. p. 944) June 13, 1946. *e* Plus sales tax. *f* Up to 18 ft. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* FBM, scarce, no stable quotation, no ceiling. *j* No fir available in the city at this time.

Note: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue carload lots, delivered per 1,000 sq ft surface. Seattle base price on ⅜". $95 15; on ¾". $104.85; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10 50 per M

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS Discounts from jobbers list, Aug 15, 1938 Single or Double Thickness A quality	B quality	EXPLOSIVES Per lb 40% Ammonia Gelatin in 50-lb cases delivered in 200 lb. lots*
Atlanta	74%	75%	$0.16
Baltimore	78%	79%	.16
Birmingham	76%	76%	.115
Boston	77%	78%	.16
Chicago	77%	77%	.16
Cincinnati	77-10%	77-10%	.16
Cleveland	77%	77%	.20
Dallas	76%	76%	.1675
Denver	76%	76%	.165*e*
Detroit	77%	77%	.1675
Kansas City	77-10%	77-10%	.165
Los Angeles	86%*d*	88%*d*	.1675
Minneapolis	77%	77%	.165
Montreal	40-10-2%*ab*	50-2%*ac*	.1775†
New Orleans	70%	75%	.17
New York	80%*g*	81%*g*	.23*f*
Philadelphia	78%	79%	.16
Pittsburgh	79%	79%	.1325
St. Louis	77-10%	77-10%	.165
San Francisco	66%	73%	.165
Seattle	75%	75%	.1675†

Price of 60% Ammonia Gelatin is $0.01 per lb higher than 40%

[1] Discount from list Sept 1939: sales tax included, but 6% tax exemption not allowed for *b* Single thickness *c* Double thickness *d* Discount from jobbers' list Sept 15, 1928 *g* Discount from jobbers list Jan. 16, 1946

* Urban prices influenced by service charges or local storage and delivery regulations do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings Queens and Richmond, and in Manhattan south of Canal St add delivery charge of $6 00 per trip †F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb net	Tons	200 lb. lots
E. of the Miss., except Fla and Me	$0.115	$0.14	$0.16
W. of Miss. to Rocky Mtn. States, Fla. and Maine	.12 -.1275	.145 -.1275	.165 -.1775
Rocky Mtn. States	.12 -.1325	.145 -.1625*e*	.165 -.1825*e*
Pacific N. W. States	.1175-.13	.1475-.16	.1675-.18
Pacific S. W. States	.1150-.1225	.145 -.1525	.165 -.1725

e F.o.b. Louviers, Colo. or Butte, Mont.

PILES, TIES F.O.B.

PILES

Prices per linear foot, fir and pine, bark on, f.o.b. cars, New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk

Dimensions	Points	Length	By Rail Pine *	By Rail Fir
12-in. at butt	6-in	30 to 50-ft	$0.34	.....
12 in — 2 ft. from butt	6-in	50 to 59-ft	.35	.....
12-in — 2 ft. from butt	6-in	60 to 69-ft	.36	.....
12-in — 2 ft. from butt	6-in	90 to 100-ft	...	.54
13-in — 3-ft. from butt	5-in	91 to 100-ft.	...	.56
14-in — 2-ft. from butt	6-in	50 to 69-ft	.41	.63
14-in — 2-ft. from butt	6-in.	70 to 79-ft	.43	.57
14-in — 2-ft. from butt	5-in	80 to 85-ft	.54	.....
14-in — 2-ft. from butt	5-in	85 to 89-ft	.57	.....
14-in. — 2-ft. from butt	5-in	90 to 100-ft.	...	.62

* Pine piling over 80-ft available only in limited quantities.

RAILWAY TIES

Prices f.o.b. per tie for carload lots:		6"x8"x8' Untr	6"x8"x8' Tr	7"x9"x8'6" Untr	7"x9"x8'6" Tr
Boston	Oak	$1.50	....	$2.00	....
	Pine	2.00	$3.00*a*	2.50	$3.00*a*
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.42	3.58
Birmingham	Hardwood	1.00	1.60*a*	....	2.25*a*
Chicago	Red Oak	....	2.45/2.65*a*	....	3.35/3.60
Los Angeles	Douglas Fir	2.10	3.35*a*	3.00	4.80*a*
Philadelphia	Red Oak	....	2.10*ag*	....	3.25*ag*
St. Louis	White Oak	1.80	....	2.40	....
	Red Oak	1.73	2.25*a*	2.19	3.25*a*
	Sap Pine or Cypress	1.80	....	2.06	....
San Francisco	Douglas Fir	1.25*bef*	....	....	3.00*eaf*
Montreal	Birch or Maple	....	1.65	1.04	....

Tr — Treated: Untr — Untreated *a* Creosoted *b* 6"x8"x8'6" *c* Empty cell *d* Zinc *e* Green *f* F.o.b. cars † Out of market *g* January 1943 price, none later available

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots New York

Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.50- 3.10
Chlorine cylinders, liquid, per lb., delivered	.0525
Calcium chloride, 77-80%, flaked, 100-lb paper bag, del'd, ton	18.50-35.00
Silicate of soda, 52 deg. in drums, f.o.b. works, per 100 lb.	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00-25.00
Sulphate of copper, in bbl., per 100-lb.	5.00

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME — DELIVERED

	STRUCTURAL CLAY TILE PARTITION — SCORED Per M lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M lots of 2,000 pieces or over			BRICK Per M in quantity		LIME		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized, or lump
Atlanta	$110.00	$130.00	$230.00	$240.00	$270.00	$300.00	24.00	$24.00	$19.00	$17.50	$17.50
Baltimore	90.00	95.00	175.00	200.00	260.00	300.00	23.75*k*	29.75*k*	20.00	15.00	2.50*m*
Birmingham	91.00	96.00	133.00*e*	216.00	.....	.....	18.50	21.00	19.11	15.05	16.05
Boston	105.00†	112.00†	210.10†	252.09†	.....	.....	20.00*i*	20.00*i*	21.00†	.....	16.00
Chicago	92.10	98.40	185.20	.....*x*	.....*x*	.....*x*	17.00	18.00	18.00	16.00	.....
Cincinnati	75.39	80.39	150.90	170.91	242.35	277.25	33.00	33.00	16.90	14.40	.....
Cleveland	98.10	104.55	.....*x*	196.00	.....	.....	24.00	24.00	17.05	14.85	19.55
Dallas	77.25	83.00	165.00	198.00	254.50	315.00	17.25	19.00	19.00	15.00	15.00
Denver	105.20	119.00	198.25	230.00	263.50	315.25	24.00	.....	30.00*j*	24.00*j*	26.00
Detroit	92.70	96.70	174.50	198.80	257.20	294.30	23.25*f*	23.25*f*	22.00	20.00	20.00
Kansas City	.....	.....	.....	.....	.....	.....	17.50	18.50	30.40	24.00	24.00
Los Angeles	82.50†*r*	97.50†*r*	135.00c†*r*	210.00†*r*	368.00†*r*	460.00†*r*	16.50	18.50	16.50	17.50	17.50
Minneapolis	.....	112.00*b*	186.25*b*	112.00*aa*	.....	.....	18.50*v*	.....*g*	26.00*bb*	21.00*bb*	24.00*bb*
Montreal	92.50*a*	98.50*a*	196.25*a*	151.50*a*	.....	294.40*a*	22.16†*u*	29.41†*u*	18.00*u*	15.00*u*	14.00*u*
New Orleans	104.50	109.55	207.25	222.25	326.90	385.65	17.75	.....	18.30	12.08	14.10
New York	103.90	110.80	152.35	164.20*hn*	.....*x*	.....*x*	25.50	.....	20.00	14.00	17.00
Philadelphia	112.10	119.60	224.20	269.10	321.20	405.10	20.75	23.75	22.00	18.00	17.00
Pittsburgh	98.50	105.90	181.85	217.30	265.85	303.10	23.25	25.25*y*	19.40*cc*	16.90*cc*	2.55*m*
St Louis	.....	.....	.....	.....	.....	.....	26.00*s*	25.00*s*	22.00*s*	18.00*s*	.....*x*
San Francisco	102.40	115.20	153.60	115.20*r*	.....	.....	21.00	.....	19.90	19.90	1.99*m*
Seattle	129.25	141.50	.....*x*	141.50*cc*	.....	.....	22.50*k*	27.75*k*	20.00*s*	20.00*s*	3.00*m*

† F.o.b. *a* Smooth *b* Carload lots delivered to job *c* 6 x 12 x 12 in. *f* Includes $3.50 per M. for delivery. *g* No quotation. *h* F.o.b. Perth Amboy N. J. *i* F.o.b. Warehouse only. *j* OPA Price *k* $1.00 discount. *m* Per bbl., 180 lb. *n* 7⅝ x 7⅝ x 12. Speed tile. *o* Per bbl., 200 lb *r* 5% discount 10 days. *s* 2% discount for cash. *t* 5⅝ x 8 x 11⅛. *u* 8% sales tax included. *v* sand lime. *x* Not available. *y* Stacked. *aa* 5 x 8 x 12 in. *bb* LCL delivered. *cc* Truck delivery

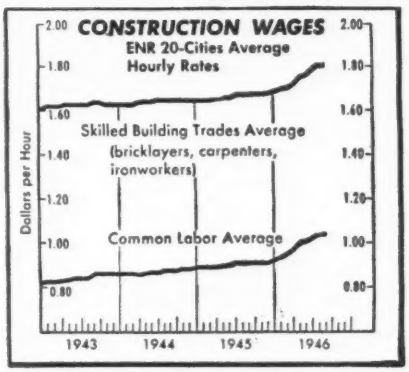
PAINT, ROOFING — F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *c*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b., factory Rolls, slate surfaced, 85-90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal	Tar pitch 360 lb bbl per ton
Atlanta	$13.25	$17.125	$1.30	$2.25	$1.20	$2.06	$2.06	$2.06	$1.00	$36.00
Baltimore	13.00	16.75	2.00	3.00	2.50	2.35	2.90	2.90	.40	29.00
Birmingham	13.25	17.125	....	....	....	2.28	2.20	2.20	.32	28.70
Boston	13.00	16.75	1.75	2.50	2.31	2.00‡*h*	3.30‡*u*	3.30‡*u*	.25‡	21.00‡
Chicago	13.00	16.75	....	....	....	1.75*h*/	1.99*h*/	1.99*h*/	.33/	23.00/
Cincinnati	13.00	16.75	1.70	2.90	1.60	2.20	2.10*h*	2.10*h*	.33	25.00
Cleveland	13.00	16.75	....	....	....	1.71	1.63*h*	1.61*h*	.237	25.00
Dallas	13.00	17.50	1.88	2.95	.06*l*	1.89*h*	2.00*h*	2.00*h*	.65	39.00
Denver	13.00	17.25	1.80	13.2*k*	16.15*k*	3.00	1.92*h*	1.92*h*	.29	29.00
Detroit	13.00	16.75	1.75	3.00	1.60	2.25	2.25	2.25	.50	23.00
Kansas City	13.00	16.875	2.30*g*	2.55*g*	2.16*g*	2.50	2.75	2.75	.52	.....
Los Angeles	13.25	17.25	2.00	2.60	2.50	2.10	1.50	....	.45	.....
Minneapolis	13.00	16.875	....	....	....	1.7123*i*	1.6243*hi*	1.6243*hi*	.32	23.00
Montreal	.....	.....	2.50*p*	4.90*p*	3.15*p*	2.71	2.45*t*	2.45*t*	.84*t*	1.83*kt*
New York	13.00	16.75	2.03	....	1.82	1.9006	1.8468*o*	1.8468*o*	.26	23.00
Philadelphia	13.00	16.75	1.60/1.80	2.20	1.55	2.25	2.71	2.71	.32	23.00
Pittsburgh	13.00	16.75	1.75	2.20	1.60	2.15	2.09*h*	2.09*h*	.34	27.00
St Louis	13.00	16.75	2.28*s*	2.89*s*	1.96*s*	2.01*h*	2.01*h*	2.01*h*	.46	28.00
San Francisco	13.25	17.00	1.80	2.75*n*	1.35	1.7613	4.72	2.472	.3399	21.115
Seattle	13.25	17.25	1.90	3.00	....	2.15	2.16*h*	....	.35	31.00*j*

‡ Delivered **Note:** Red lead in oil 50c higher than white lead in oil *a* Red lead prices change frequently due to pig lead price changes *b* U S War Dept Spec 3-49A. *c* ASTM Spec D266-31 *d* 80% minimum ferric oxide D stributors' price to contractors *g* 55 gal can *h* Per roll, 65 lb *i* Minneapolis and vicinity *j* Asphalt pitch, *k* Per 100 lb *l* Per lb. *n* May, 1941 price *o* 60-lb roll *p* Plus 8% sales tax. *s* December, 1942 price. *t* Federal tax included *u* 90-lb roll *v* Truck delivery.

SKILLED AND COMMON WAGE RATES — PER HOUR

	Bricklayers	Carpenters	Struct Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$2.00	$1.50	$1.625	$1.50	$1.62	$0.75	$0.80
Baltimore	1.90	1.675	1.90	1.625/2.00	1.725	.95	.95
Birmingham	1.9375	1.50	1.625	1.50	1.65	.65	.65
Boston	1.725	1.60	1.85	1.65	1.667	1.15	1.15
Chicago	2.00	1.95	1.88	1.95	2.00	1.30	1.30
Cincinnati	1.875	1.65	1.775	1.875/2.125	1.875	.95	.95
Cleveland	2.00	1.90	2.00	2.00	2.00	1.25	1.25
Dallas	1.9375	1.425	1.625	1.625	1.75	.80	.80/1.25
Denver	1.80*b*	1.625	1.50*b*	1.625*b*	1.90	1.00	1.00
Detroit	1.90	1.75	1.825	1.675/1.825	1.90	1.15	1.15
Kansas City	2.00	1.75	1.875	1.875	2.00	1.175	.90
Los Angeles	2.00	1.65	1.90	1.65	2.05	1.25	1.25
Minneapolis	1.825	1.65	1.75	1.60	1.725	1.15	1.15
New Orleans	1.625	1.375	1.625	1.55	1.625	.70	.80
New York	2.25*b*	2.10*b*	2.25	2.25*b*	2.25*b*	1.25	1.20
Philadelphia	2.00	1.775	1.90/2.00	2.25	2.00	1.025	1.025
Pittsburgh	2.15	1.875	1.75	1.8125	2.00	1.15	1.15
St Louis	2.00	1.95	2.00	2.20	1.90	1.20	1.20
San Francisco	2.05	1.75	2.00	1.85	2.00	1.25	1.25
Seattle	1.975	1.675	1.80	1.90	1.975	1.275	1.275
Montreal*	1.17	1.06	1.11	1.07	1.17	.62	.65



b 7 hr day * Cost of living bonus now included in basic wage

ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.8244

ENR Common Average: $1.0707.

single stage • side suction

centrifugal pumps . . .

by CARVER

Unsurpassed for performance
They're NEW in design and HIGH in efficiency. Look at all these features:

IMPELLER—Closed-back design automatically seals stuffing box and dispenses with need of a second wearing ring.

SUCTION HEAD—Protected from wear by a renewable wearing ring.

DISCHARGE NOZZLE—May be turned to any one of four positions.

SHAFT—Protected from wear or corrosion by a stainless steel or Monel sleeve.

STUFFING BOX—Accommodates either conventional packing or mechanical seal.

GLAND—Split to provide greater ease in removal and in eventual replacement of packing.

Every feature is designed to assure long, smooth-running, trouble-free operation. Available for either belt drive or direct connected to electric motor or other power source in sizes 40 to 900 GPM, and heads up to 180 ft. Write for new Bulletin No. 201 for details.

CARVER PUMP COMPANY

MUSCATINE, IOWA

New Engineering Books

(*Continued from page* 112)

LEGAL PHASES OF CONSTRUCTION CONTRACTS—By I. Vernon Werbin. 267 pp. McGraw-Hill Book Co., New York 18. $2.75.

BUILDERS FOR BATTLE: How the Pacific Air Bases Were Constructed—By David O. Woodbury. 415 pp. E. P. Dalton & Co. New York. $7.50.

ROCK TUNNELING WITH STEEL SUPPORTS—By R. V. Proctor and T. L. White, with a section on Rock Defects and Loads on Tunnel Supports by Karl Terzaghi. 271 pp. The Commercial Sheaving & Stamping Co., Youngstown 1, Ohio. $2.50.

PROPOSED MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES—By Committee 315, American Concrete Institute in cooperation with the Concrete Reinforcing Steel Institute. 55 pp. American Concrete Institute, New Center Bldg., Detroit 2. $2.50.

NEW YORK AND ITS FUTURE—51 pp. The Bankers Trust Company, New York. Limited free distribution.

Reports and Pamphlets

AN APPRAISAL OF LAND AND WATER RESOURCES IN THE POTOMAC RIVER BASIN—Interstate Commission on the Potomac River Basin, 520 Transportation Building, Washington 6, D. C.

CATALOG OF AMERICAN STANDARDS—American Standards Association, 70 E. 45th St., New York 17, N. Y.

PLANNING ST. PAUL FOR BETTER LIVING—Report of the City Planning Board, St. Paul, Minn.

PITTSBURGH: GROUNDWORK AND INVENTORY FOR THE MASTER PLAN—Department of City Planning, Pittsburgh, Pa.

METROPOLITAN ST. LOUIS BLUEPRINTS ITS FUTURE—May 22 Edition of *St. Louis Commerce*—St. Louis Chamber of Commerce, St. Louis, Mo.

THE HIGHWAY STREET AND AIRPORT MANUAL—1945 Edition—*Public Works* Magazine, 310 East 45th St., New York 17, N. Y.

YOU AND YOUR CITY—The United States Conference of Mayors, 730 Jackson Place, N. W., Washington, D. C.

HIGHWAY AND TRANSPORTATION—Atlanta Georgia 1946—Prepared for the State Highway Department of Georgia by H. W. Lochner & Co., and De Leuw, Cather & Co., Chicago, Ill.

THE HANDBOOK OF STEEL JOISTS: Construction, Specifications, Loading Tables and Properties—16 pp. The Steel Joist Institute, 3709 24th St., N. E., Washington 18.

YOU AND YOUR NEIGHBORHOOD: A Primer for Neighborhood Planning—Revere Copper and Brass, Inc., 230 Park Ave., New York 17.

THE PROTECTION OF PUBLIC INTEREST IN CONTRACTS—By Herman G. James. 90 pp. Public Administration Service, Chicago 37, Ill. $2.

USE OF AIR-ENTRAINING CONCRETE ON PAVEMENTS AND BRIDGES—No. 13 of Current Road Problems. Highway Research Board, 2101 Constitution Ave., Washington 25, D. C.

LORAINS LEVEL MOUNTAIN TOPS
for West Virginia Airport

1¾ yd. Lorain-80 eats its way through a mountain top rock cut.

MOUNTAINS—not meadows—serve as the locale for the new Kanawha, W. Va. Airport. Leveling the 400 acres required calls for 9½ million yards of excavation, 40% of it rock—involves clipping up to 130 feet off mountain tops and filling valleys ranging up to 210 feet in depth.

The contractor, Harrison Construction Co., Pittsburgh, Pa., having purchased a total of 24 Lorains, is using a full range of Thew-Lorain equipment, from the big 2-yard Lorain-82 "rock buster" shovel down to the agile, fast-stepping Moto-Crane. Over 4 million yards have been moved to date, with the Lorain shovels averaging 1200 yards per 8-hour shift.

Predominance of Lorains on many important contracts such as this gives proof to the fact that every unit in the Lorain line (½ yd. and up) is tops in its class. Catalogues on any or all of these shovels and cranes can be obtained from your local Thew-Lorain distributor.

Moto-Crane, wielding 4500 lb. skull cracker on oversize rock fragments, eliminates secondary blasting.

Reg. Trade Mark

thew-Lorain

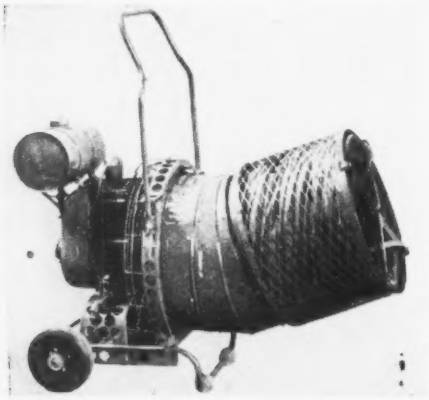
THE THEW SHOVEL CO.
LORAIN, OHIO

CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

New Aids to the Constructor

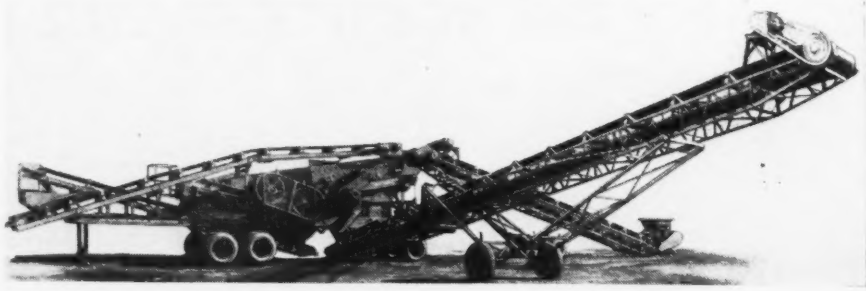
MANUFACTURERS' LATEST DEVELOPMENTS IN EQUIPMENT AND MATERIALS

Self-Powered Ventilator—Said to be useful for cooling machinery and hot spaces, such as repair shops, ventilating tunnels, manholes, storage tanks, and gasoline barges, a self-powered ventilator consists of high-capacity fan powered by lightweight gasoline engine and electric motor with wire cage containing collapsible 14-in.-dia., 16 ft. long directional



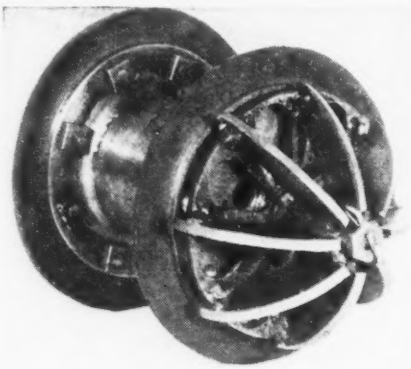
air duct of weather and heat resistant material. Duct and cage are quickly removable from unit. Air delivery is adjustable up to 4,500 cu. ft. per minute.

Ventilator is mounted on light, tubular metal frame equipped with two rubber-tired wheels. It weighs only 87 lb., complete with duct.—*Herman Nelson Corp., Moline, Ill.*



Two-Unit Gravel Plant—A postwar development of considerable importance to operators of portable rock and gravel plants consists of a two-unit plant of high capacity, completely portable, flexible, and light enough in weight to pass state highway limits. Low headroom is also afforded, thereby simplifying and greatly increasing maneuverability. Two units are provided for each plant setup; a primary unit and a secondary unit. For gravel, the primary unit includes a feeder conveyor, a scalping screen, a primary jaw crusher and a power unit, all mounted on a 3-axle truck. This is a complete, self-contained unit with mechanical feeder and shovel hopper. For rock, the primary unit includes an apron feeder, a primary jaw crusher and a power unit, all mounted on a 3-axle truck.

The secondary unit for both types includes a feeder conveyor; a 4x10-ft. vibrating screen, a 40x22-in. roll crusher, a return conveyor and a power unit, all mounted on a 3-axle truck.—*Pioneer Engineering Works, 1515 Central Ave., Minneapolis 13, Minn.*



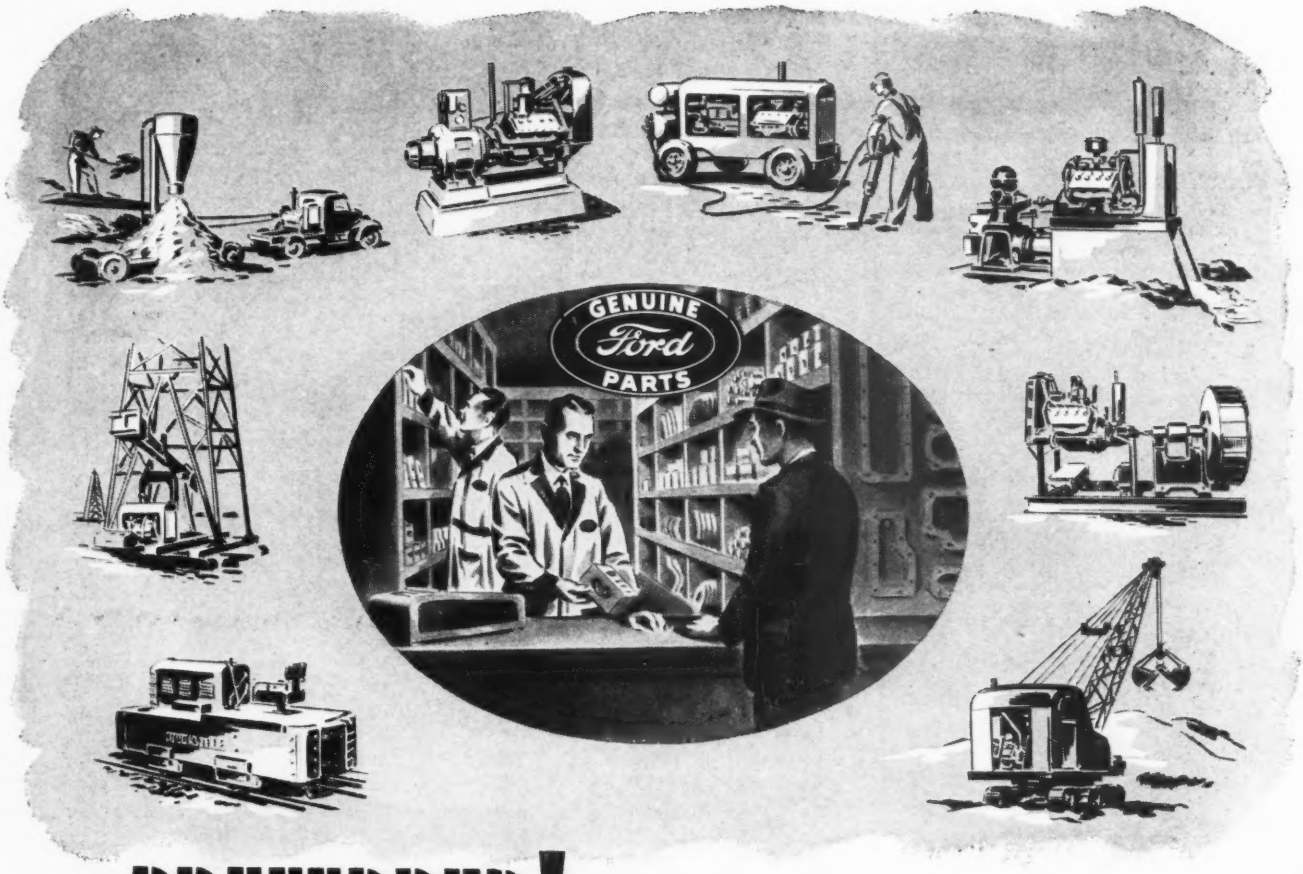
Pipe Reamer—A new reaming tool, the Reese reamer, for cleaning out pipe lines, vertical or horizontal, in buildings, factories, mines, oil lines and water mains, works alone, pressure driven, using no cables nor rods. It is easy to install, and works quickly, eliminating down time.

The reamer will make turns up to 90 deg. and will travel up to several miles of continuous uniform size of pipes without breaking open the pipe line or reinstallation. It is made in sizes for all commercial and industrial types, 2½ to 36 in.—*J. D. Reese Co., 1015 Chestnut St., Philadelphia 7, Pa.*

Heavy-Duty Shovel—Type 111-M 3½ to 4-cu. yd. shovel is quickly convertible to dragline, clamshell or crane service. It is of all-welded construction with balance in design providing for low center of gravity, making it stable under all digging conditions. Variable crawler widths and lengths are offered. Upper machinery deck features simplicity and accessibility. Gantry, designed for quick knockdown for rail shipment, can be lowered to cab roof level by paying out boom hoist line. For crane or pile driver service, unit is equipped with heavy-duty, box section type boom with steel angles and pipe-section bracing. Boom point section is of gooseneck design to permit minimum radius operation. Independent live boom hoist can be supplied for crane service. Machine is diesel powered.—*Marion Power Shovel Co., Marion, Ohio.*

Roofing Mat—Employed as a carrying and reinforcing agent for bitumen in roofing applications, Fiberglas Roofing Mat, Code S11 Y02 and S11 Y12, is a jackstraw arrangement of glass fibers bonded into a uniform felted sheet. Code Y02 mat has lines approximately 3/16-in. wide parallel to the running length; Code Y12, without lines, is used as an edging mat.

The mat has a nominal thickness of 0.015 in. and weighs 0.0101 lb. per sq. ft., with a minimum breaking strength of 10 to 14 lb. per inch width. Bitumen, penetrating the highly porous mat, provides a waterproof medium. The non-



PREFERRED! for the way they SERVE . . . and the way they're SERVICED!

The more a man has to depend on any engine-driven industrial unit on the job, the bigger the advantages a Ford-built engine will give him.

Ford engine reliability, efficiency and economy are time-proved *facts,* known and accepted the world over. And when you back up these facts with famous, universal Ford Dealer Service, you have an unbeatable combination.

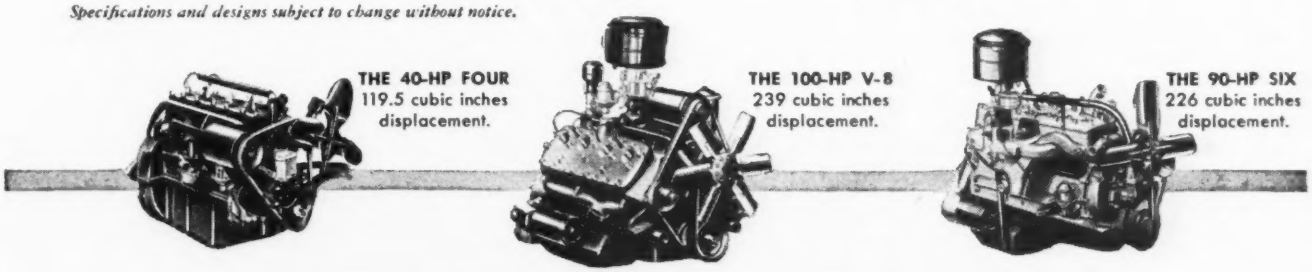
Thus, Ford-powered equipment is easier to sell. And the use of a Ford engine eliminates any need for the equipment manufacturer or distributor maintaining extensive engine service parts stocks. Ford Dealers and Parts Distributors gladly shoulder that responsibility.

You'll see more and more fine and popular equipment powered with these great engines, now that they're available once more. Light plants, pumps, compressor units, portable power units, saw rigs, mills, blowers and many other pieces of equipment have been developed with Ford engines to furnish the sure-fire power.

The three popular Ford-built engines, shown below, are now available to manufacturers and individual purchasers. Each offers reliable, enduring power applicable to a wide range of uses. For detailed specifications and dimensional data, write—

FORD MOTOR COMPANY
Industrial and Marine Division, Dept. 80
DEARBORN, MICHIGAN

Specifications and designs subject to change without notice.



THE 40-HP FOUR
119.5 cubic inches displacement.

THE 100-HP V-8
239 cubic inches displacement.

THE 90-HP SIX
226 cubic inches displacement.

FORD-BUILT ENGINES

NOW AVAILABLE FOR INDUSTRIAL AND MARINE POWER

FORMULA No. 640

a clear liquid waterproofing for old or new construction

PENETRATES
deeply—one inch or more—is not a surface treatment. Brush, spray, or float on stone, cast stone, concrete, mortar, stucco, tile, brick, plaster, wood, wall board — any absorbent material.

WATERPROOFS,
preserves, prevents dusting of floors, surface dirt washes away in rain.

FORMULA No. 640
is a balanced formula of seven different waxes and resins in a hydrocarbon solvent.

ACID-ALKALI proof
does not oxidize, unchanged by temperature.

PERMANENCE
It is our opinion it will last as long as the concrete, mortar, stucco, etc. lasts.

OIL PAINT
saponifies on cement unless sealed first with Formula No. 640.

APPLY to either side:
The pressure side, or opposite side —it is equally effective.

HYDROSTATIC PRESSURE
a 20 foot head has been held by Formula No. 640.

CUTS WATERPROOFING COSTS

because it applies three times as fast as paint, requires no special technique.

No preparation—comes ready to apply.

Eliminates necessity of furring.

Concrete floors and walls need no membraning.

Keeps in all climates

Harmless to use

Good coverage

Moderate price

Write our Engineering Department for office test kit, technical data, or regarding any special problem.

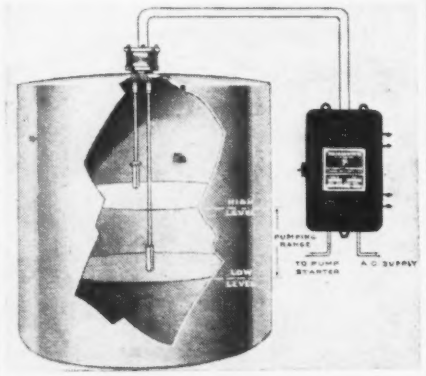
J. Wilbur Haynes, Engineer

OTHER PRODUCTS: Formula No. 640 Toxic, combines waterproofing with termite and fungus protection; cement hardener; floor mastic; roof coatings, etc.

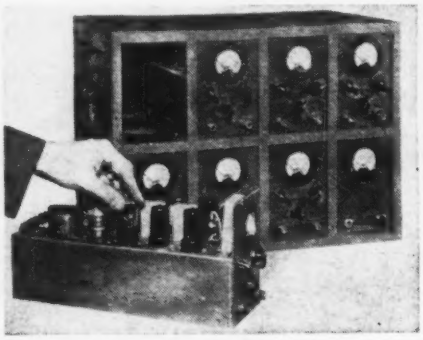
HAYNES PRODUCTS CO.
4007 Farnam St.,
Omaha 3, Nebr.

cellular structure of the glass fibers is unaffected by heat.—*Owens-Corning Fiberglas Corp., Toledo, Ohio.*

Level Control—Level control of all electrically conductive liquids in the sanitary and sewage fields is now possible with Photoswitch level control Series 10, it is announced. This floatless control contains no vacuum tubes and operates



with low voltage in the probe circuit. Contact with the liquid is made only by a stainless steel probe rod. With AC in the probe circuit no electrolytic action is possible, it is stated, and mica insulated probes insure against leakage.—*Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.*



Strain-Gage Amplifier — Useful in development and testing laboratories, a strain-gage amplifier has been designed for use with resistance-wire, electromagnetic and magnetostrictive strain gages to amplify small electric signals varying in frequencies from 0 to 1,000 cycles per second. It operates in conjunction with either a magnetic oscillograph or a cathode ray oscilloscope. This small, light weight amplifier operates on 115-volts, 60-cycle AC, or 24-volts battery.—*General Electric Co., Schenectady, N. Y.*

Air Line Check Valve—There are only two main parts in the Numatic safety check, a new device that eliminates the danger of wildly whipping air hoses by shutting off air in case of excessive flow. The check, for working pressures up to 250 lb. comes in standard ½ and ¾-in. sizes.

With this device in use, it is said to be unnecessary to crimp a hose to shut off air while changing tools. Another ad-

Adams DISTRIBUTORS
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MINN.. Minneapolis & Duluth—Roshot Equipment Co.
MISS.. Jackson—Mississippi Road Supply Co.
MO.... St. Louis—Missouri-Illinois Tractor & Equip. Co.
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Great Falls—Hi-Line Equipment Co.
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El Paso—Hardin and Coggins
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VA..... Richmond—Municipal Sales Company
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Alexandria—Phillips Mach. & Tractor Co.
WASH.. Seattle—Howard-Cooper Corp.
Spokane—Intermountain Equip. Co.
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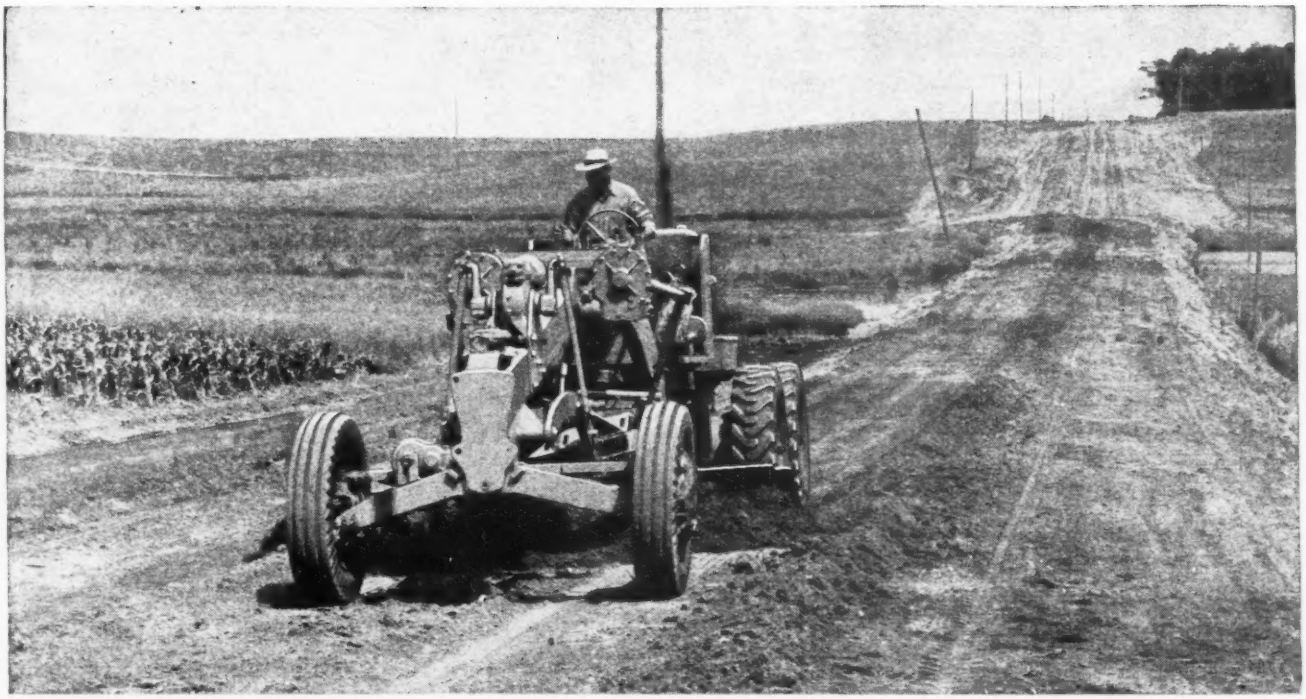
SEE Adams AD ON OPPOSITE PAGE

faster action with ADAMS motor graders



Picture shows an Adams Motor Grader finishing a new road. Adams conveniently located cab controls enabled operator to get all blade positions required for bank sloping, ditching and surface work—without leaving cab to make mechanical adjustments.

● When you buy an Adams Motor Grader you get action—*fast action* . . . the kind that pays big dividends in time and money. For example:

Adams' Push-Button Starting starts the big Diesel engines, quickly, easily—gets grader going without loss of time.

Adams' Fast Transport Speed—up to 21 mph—gets grader to the job faster . . . means more time on the job—*at work.*

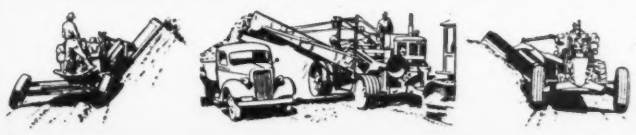
Adams' Power-Operated Blade Controls move the blade at fast constant speeds to virtually all desired positions—*without costly, time-wasting stops for mechanical adjustments.*

Adams' 8 Overlapping Forward Speeds instantly provide fastest practical speed for every grading operation.

Adams' Positive Mechanical Steering assures fast, safe directional control—*at all times, at all speeds.*

In every phase of design and construction, you'll find Adams Motor Graders built to deliver faster, smoother, more efficient operation—*to do more work, better, at lower cost.* See your local Adams dealer.

J. D. ADAMS MANUFACTURING CO., INDIANAPOLIS, IND.



ADAMS

ROAD BUILDING AND EARTH-MOVING EQUIPMENT

Thoroughbreds "Pay Off"

. . . . IN ENDURANCE AND TOP PERFORMANCE

Though meters can be purchased at lower cost, this Builders precision instrument is a *best buy* because:

- Long life makes cost per year extremely low. Builders Herschel Standard Venturi Tubes and Type M Register-Indicator-Recorders are functioning with original accuracy after more than thirty years' service.
- Low head loss means efficiency. Reduced pumping costs pay dividends every day in the year. Useful head on gravity systems is conserved.
- Trouble-free design — no moving parts in pipe line; no shutdown during maintenance or adjustment.
- The high accuracy and wide range of the Type M Register-Indicator-Recorder contribute to greater efficiency in plant operation. Results averaging better than plus or minus two per cent over flow range as wide as 1 to 15 or more are readily obtained.

For Bulletin 293-C, address Builders-Providence, Inc. (Division of Builders Iron Foundry) 51 Codding Street, Providence 1, Rhode Island

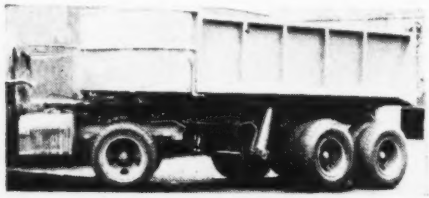
Builders type M Venturi Instrument and Herschel Standard Venturi Tube. Short Venturi Tube also available.

BUILDERS PRODUCTS

Venturi, Propelofio and Orifice Meters • Type M and Flo-Watch Instruments • Filter Controllers and Gauges • Master Controllers • Kennison Nozzles • Chronoflo Telemeters • Builders Chronoflo Conveyor Scales

BUILDERS PROVIDENCE Instruments

vantage is that wear on compressors is much reduced because air loss is minimized.—*Hackett Mfg. Co., Oakland, Calif.*



Dump Trailer—Announcement of a new dump trailer with 19 cu.yd. capacity has been made. The trailer is especially designed for coal delivery, but can be used equally well for hauling sand, gravel and other materials. Body dimensions are 18 ft. x 7 ft. 5 in. x 47½ in. Also available are models with 8-⅓ and 15½ cubic yard capacity.—*Fruehauf Trailer Co., Detroit, Mich.*

Oxy-Acetylene Cutting Torch—A new portable oxy-acetylene cutting outfit will be known as Pak-Kut. It employs the fastest method known of cutting metal—the oxy-acetylene flame cutting process. The entire outfit, complete in every detail and ready for operation as shown in the accompanying photograph—weighs only 56 lb., including two aeronautical shatter-proof oxygen cylinders, an acetylene tank of 10 cu.ft. capacity, pre-set regulators, test gauge, hoses, cutting torch, wrench, goggles, gloves and step-by-step instruction manual.

The entire outfit is mounted in a flame resistent canvas pack which can be quickly strapped across the shoulders and buckled firmly in a comfortable position. It is packaged in an easily carried, sturdy aluminum case for storage when the equipment is not in use.—*National Welding Equipment Co., 218 Fremont St., San Francisco, Cal.*

Lightweight Conveyor—A new lightweight portable conveyor for industry, the Tote-All Zephyr, brings new meaning to the word *portability* in the field of power conveyors. The 12 ft. model weighs only 135 lbs. (without motor) and is

The MONOTUBE *Method...*

a

4 LANE HIGHWAY TO BETTER PILED FOUNDATIONS

Whatever your construction job—highways, piers, bridges or buildings—you're ahead 4 ways when you depend on the proved integrity of one foundation pile—the tapered, steel Monotube.

Check these advantages for yourself:

1. ***Tapered, fluted design permits faster driving with average job equipment.***
2. ***Durable, yet light in weight for easy handling.***
3. ***Easily extended to desired length right on the job.***
4. ***Tubular construction for quick, thorough inspection before concreting.***

Learn for yourself how tapered, steel Monotubes can help you do your job more quickly, easily, economically by writing directly to our engineers. The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Monotube Foundation Piles

A "flying" project from the start! Four A-C torque converter tractors really make the dirt fly on this million yd. airport project at Greenbelt, Md. Owner F. W. Schrom also speeds maintenance and finishing with an Allis-Chalmers Model A-D Motor Grader.

• • •

Left: Torque converters plus pusher loading... this is the way to really move dirt! Owner Schrom assures himself of fastest possible loading and hauling, capacity loads every trip, with this combination.

Allis-Chalmers TORQUE CONVERTER Boosts Tractor Output

The Allis-Chalmers torque converter method of transmitting tractor engine power livens up tractor performance — gets much more work done.

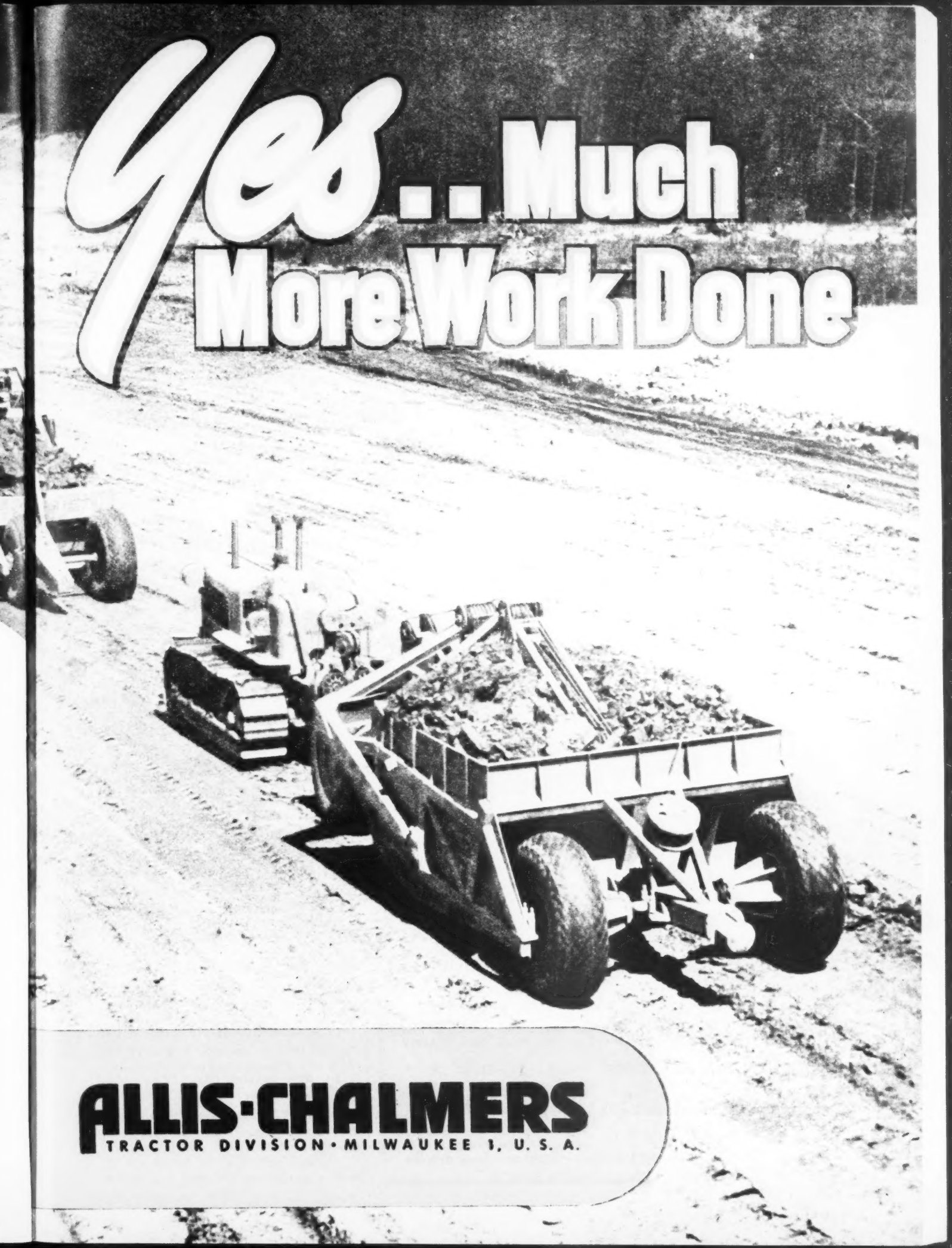
With a torque converter, highest possible speeds at which load can be moved are automatically selected in each of the three forward and reverse speed ranges. This gives you infinite working speeds in each gear — from zero to maximum. Assures peak tractor performance at all times. Keeps gear shifting to an absolute minimum.

There's no restarting, either. Engine cannot be stalled!

Operation is continuously smooth. Cushion of oil between engine and tractor train protects tractor and auxiliary equipment from shock and abuse. There's more time on the job . . . less money spent on repairs, overhaul!

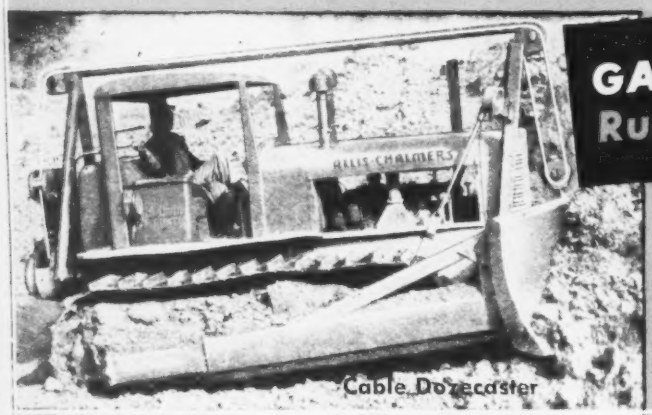
Operators go for it, too! Smooth, easy operation, less gear shifting, means less fatigue — more work done!

Yes . . . moving dirt with torque converter tractors is a new construction experience . . . worth your immediate investigation.

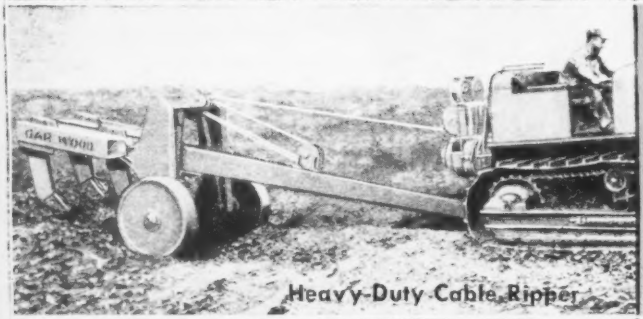

Yes...Much
More Work Done
ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Down-to-Earth Engineering

GAR WOOD Cable Controls Feature Rugged Simplicity and Direct Action Pull



Cable Dozecaster



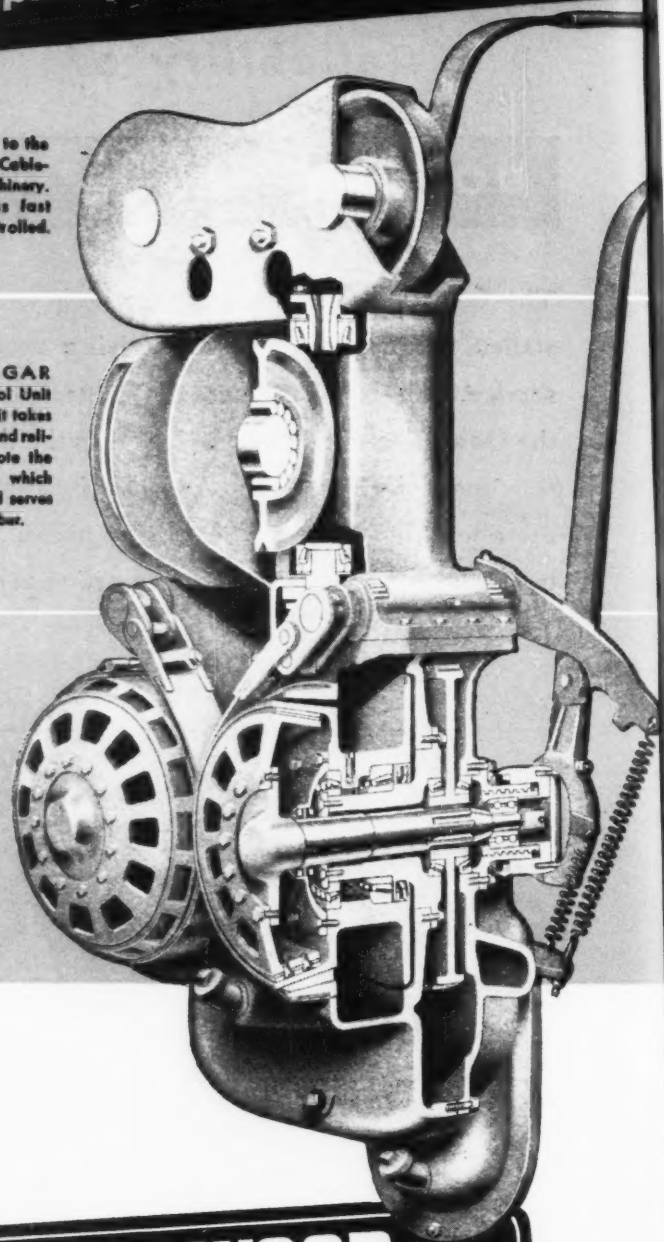
Heavy-Duty Cable Ripper

4-Wheel Cable Scraper

The cable goes direct to the job in GAR WOOD Cable-Controlled Road Machinery. As a result, it has fast action, positively controlled.

The Job-proved GAR WOOD Cable Control Unit (right) has everything it takes for smooth operation and reliable performance. Note the sturdy steel housing which prevents distortion and serves as a lubrication chamber.

Outside clutches and servo-type, self-energizing brakes cool themselves and are readily accessible. Roller bearings throughout and spur-type gears keep adjustments at a minimum.

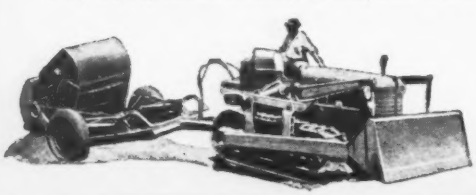


PROVED through the years on the toughest of jobs. Made more rugged than ever by the lessons learned in war action on every front, from Guadalcanal to Okinawa and from Oran to Berlin.

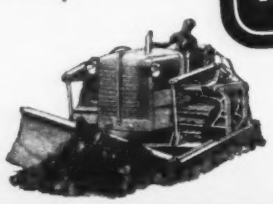
GAR WOOD Road Machinery and the famous GAR WOOD Cable Control Power Unit offers practical design and sound construction, well engineered and honestly built—equipment that *holds together* and can be operated with an absolute minimum of down time. *If it's* GAR WOOD, *it's good.*

See your Allis-Chalmers dealer. He'll be happy to give you all the facts and show you Gar Wood Earth Moving Equipment *on the job* in your own vicinity.

GAR WOOD ROAD MACHINERY
WITH ALLIS-CHALMERS DIESEL POWER



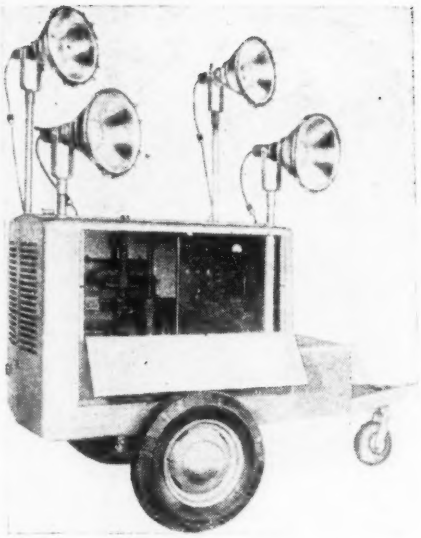
Gar Wood 2-Wheel Hydraulic Scraper and Bulldozer



Gar Wood Hydraulic Dozecaster

Sold Through
ALLIS-CHALMERS
Dealers Everywhere

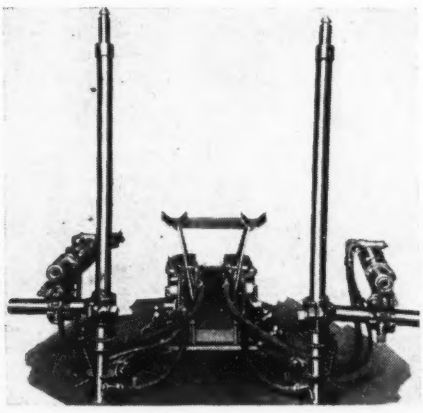
ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, INC.
DETROIT 11, MICHIGAN



phase current to four 1000 W, adjustable, wide-diffusion lamps.—*Consolidated Diesel Electric Corp., Mount Vernon, N. Y.*

Roofing Mop—Fiberglas mop unit is designed to cut costs and save time in applying bitumen to roof deck or built-up roofing felts. It consists of warp-like bundles of glass yarns, 36 in. in length and weighing about 2 lb. Two or three bundles are attached to handle to make mop. One mop tested has been used to apply bitumen to more than 100,000 sq. ft. of roofing in three-ply construction without showing serious deterioration.—*Owens-Corning Fiberglas Corp., Toledo, Ohio.*

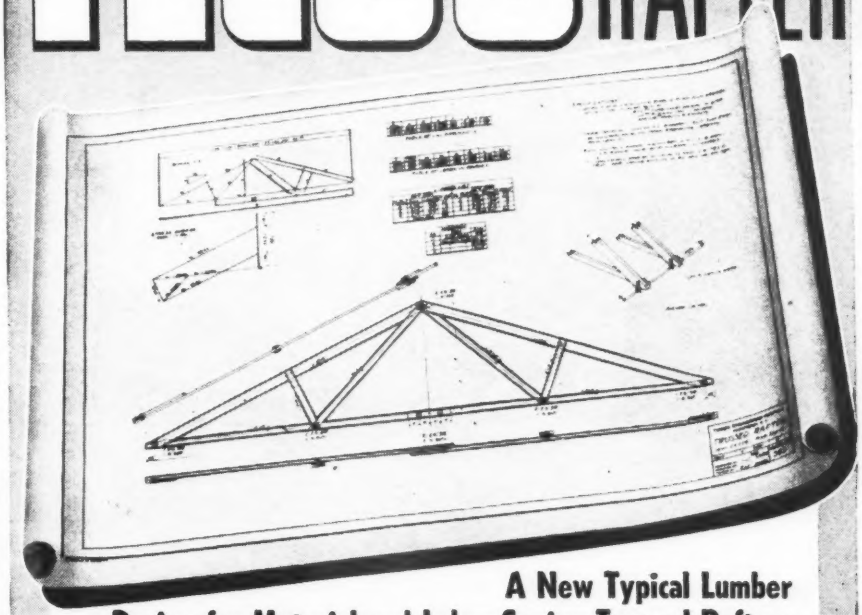
Drill-Jumbo Mounting—A new DJM air-operated drill-jumbo mounting for use in tunnelling work consists of an air column, a rack and column-arm lifting



device and linkages for proper attachment to a carriage. The column piston has a 2¾-ft. extension and different column lengths are available for various heights of back.—*Ingersoll-Rand Co., 11 Broadway, New York, N. Y.*

Vertical Flow Thickener—A new vertical flow, slurry blanket type of thickener, known as the Rex Verti-Flo Thickener, is said to be particularly effec-

More HOMES faster WITH TECO'S RAFTER



A New Typical Lumber Design for Material and Labor Saving Trussed Rafters to Help Architects and Engineers Plan Veterans' Housing.

In 180 Veterans' houses in South Bend, Indiana, 72,000 F. B. M. of lumber is being saved with Teco rafters. This means 7 more houses can be provided out of available supplies. In addition, hand fitting of rafters is minimized, line production and rapid assembly economize on manpower and money. Clear spans provide flexibility of interiors—now and later.

Get Teco's FREE trussed rafter design, #585. Mail the coupon today for your copy.

TIMBER ENGINEERING COMPANY
1319 18th STREET, N. W., WASHINGTON 6, D. C.

Gentlemen:

Please rush my copy of your typical rafter design #585 for economical house construction.

Name.....

Firm.....

Address.....

.....

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THE AGE OF ALL FORD TRUCKS IN USE TOTALS 12½ MILLION YEARS!

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• PORTABLE • FLEXIBLE • AUTOMATICALLY UNLOADS

A One-Man Operation ... Economically handles brick, tile, cement blocks, mortar, and other construction items.

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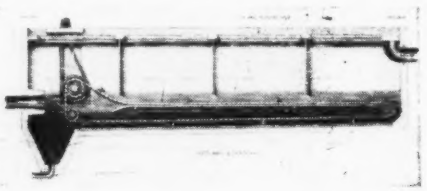
CLIPPER PORTABLE HOISTS by the Makers of CLIPPER MASONRY SAWS

tive in delivering highly clarified effluents with relatively low detention periods when handling certain types of solids. It employs cellular construction obtained by dividing a conventional sedimentation basin with proper weirs and baffles. Extremely long weir length is obtained and the adjustable weirs allow close regulation of flow distribution among the cells.

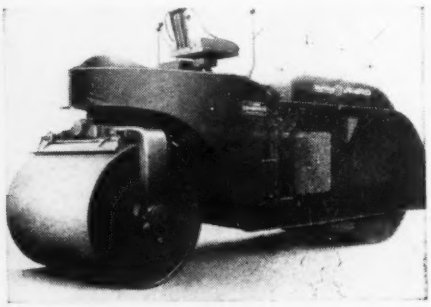
Rex Conveyor Sludge Collectors are installed on the tank to concentrate the



sludge at the influent end of the tank and maintain a fluid sludge blanket in the zone of flow immediately below the baffles. Continuous operation of the conveyor sludge remover provides a constant recirculation of sludge to the influent end of the basin.—*Chain Belt Co. 1600 West Bruce St., Milwaukee 4, Wis.*

Cold-Applied Coating — Bituplastic protects concrete, masonry and metal structures from corrosion and deterioration. It is black, irreversible dispersion which, when dry, forms tenacious waterproof film that does not revert to original state. Contains no volatile solvents and is practically incombustible, as well as odorless and tasteless. Usual application is at rate of 75 to 100 sq. ft. per gallon per coat.—*Wailes Dove-Hermiston Corp., Westfield, N. J.*

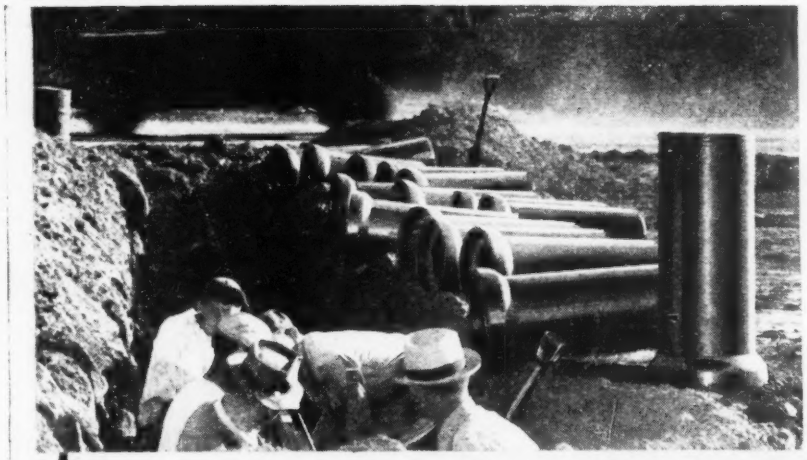
Tandem Rollers—Produced in sizes of 5-8 tons, 6-9 tons, 8-12 tons and 10-14 tons, new tandem rollers can be powered with gasoline or diesel engines. Features include bevel gear final drive, side air intake, drive-opposite-operator, simplified clutch shifter, low pressure hy-



draulic steering and compact engine, transmission and final drive pinion unit assembly.

Four-speed forward and reverse transmission provides stepped-up speed range. Removable drive roll grill provides readily accessible opening for cleaning and ventilating drive roll.—*Buffalo-Springfield Roller Co., Springfield, Ohio.*

CLAY PIPE'S LONG LIFE ASSURES



BEST DRAINAGE AND SEWERAGE AT LOW COST-PER-YEAR

THE BEST PIPE in the world for today's long-range heavy construction jobs, railroads, highways and airports is the one that lasts the longest at a low cost-per-year . . . Clay Pipe.

Clay Pipe is best because it is chemical-proof and abrasion proof . . . it nevers wears out. Clay, nature's indestructible material, is processed by vitrification to create this everlasting pipe. With its variety of fittings, Clay Pipe is quickly and easily installed. Engineers, builders and maintenance men depend on Clay Pipe more and more for efficient, long-life drainage and sewerage.

Modern Construction Tip: Extra-Strength Clay Pipe is the solution to drainage and sewerage problems where extra-heavy live or static loads must be provided for . . . where heavy vehicles roll . . . where back-fill is extra heavy . . . where the trench is shallow . . . to eliminate cradling or casement costs.

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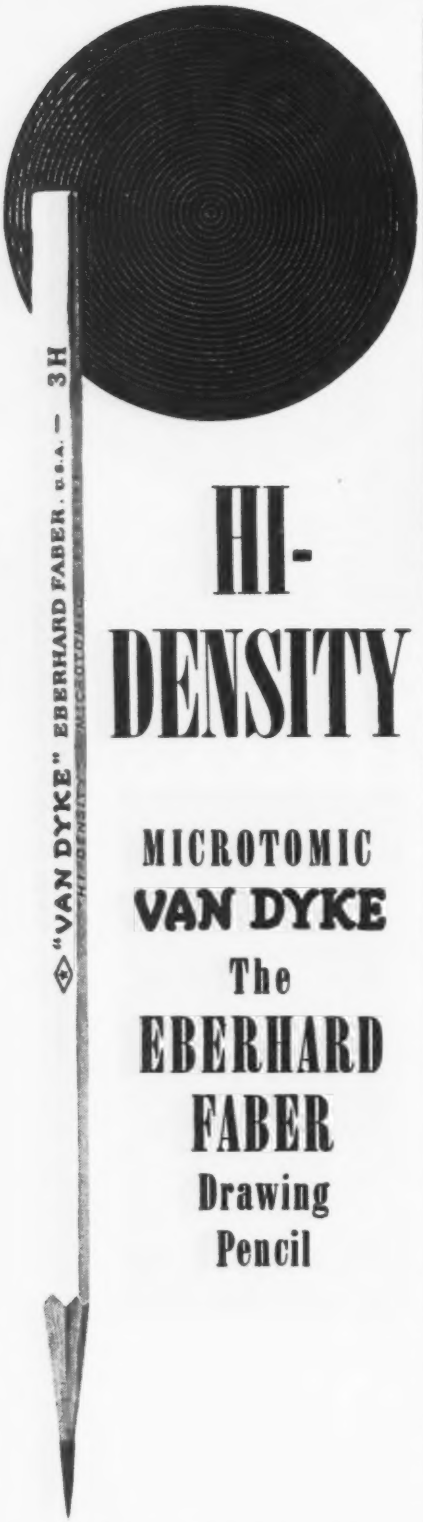

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Also in six degrees special chisel-point leads.

Manufacturers' Activities

ED GALVIN (left), executive vice president and general sales manager of La-Plant-Choate, explains the new "LPC" rubber tired prime mover to Frank J. McBath, president of Columbia Equipment Co., newly appointed distributor. Mr. McBath is national president of the Associated Equipment Distributors.

UTILIZING BY-PRODUCTS from Henry J. Kaiser's iron and steel plant at Fontana, Calif., the Mineral Wood Insulations Co. has announced the start of a $100,000 building program to manufacture insulation materials on property leased from Kaiser Co., Inc. The new company expects to get into production by Sept. 1 and will serve the Western states and markets in the Orient. Plant capacity is designed for annual capacity of 50,000 tons with initial operations calling for 20,000 tons.

THE APPOINTMENT OF Paul Merkert, Jr., and Robert Miller to the sales engineering staff of the Cummins Engine Co., nc., Columbus, Ind., has been announced. Both Mr. Merkert and Mr. Miller joined the company upon their release from active duty with the U. S. Navy.

NORMAN B. OBBARD, formerly assistant to the vice president of American Bridge Co., Ambridge, Pa., subsidiary of U. S. Steel Corp., has been named vice president in charge of sales and a director, effective July 1, to succeed Eugene H. Heald, who retired.

A. M. BYERS CO. of Pittsburgh, Pa., has announced the appointment of Buckley M. Byers as assistant manager of the company's New York Office located at 30 Rockefeller Plaza. Mr. Byers will be in charge of export sales. Mr. Byers recently returned after nearly four years service in the U. S. Navy.

THE STAFF OF FIELD WELDING ENGINEERS of The Lincoln Electric Co., Cleveland, Ohio, has been augmented by the following additions: Gordon Appleby has joined the welding engineering staff of the Philadelphia branch office; Terril S. Hoffman has been assigned welding engineer in the St. Louis area; E. James Langhurst was named welding engineer in the Chicago territory; Garret S. Parsons has returned to the Los Angeles branch office as welding engineer.

THE CAPITAL STRUCTURE of the Hercules Steel Products Co., Galion, Ohio, has been reorganized, although it will continue operation as an unincorporated subsidiary of the newly set up Hercules Steel Products Corp. of Delaware, the latter serving as holding company for the subsidiary and controlling the stock of The Galion Metallic Vault Co. There is no change in the management of either of the operating companies.

FRANK M. WILLIAMS, has been added to the technical staff of the Clay Sewer Pipe Association, Inc. He has been connected with the Ohio State Department of Highways since 1923 except for three years' service with the United States Signal Corps. Mr. Williams is to be district engineer of the association representing the State of Ohio.

STEVEN F. EVELYN has been named consulting engineer of construction equipment products of Worthington Pump and Machinery Corp., Holyoke, Mass. Howard Platts succeeds him in his former position of chief engineer of the portable compressor division.

FOLLANSBEE METAL WAREHOUSES, a division of Follansbee Steel Corp. has purchased the steel warehouse facilities of Williamson Brothers Co., Fairfield (Bridgport) Conn., and will assume operations July 1. This extension of service into New England will be in addition to warehouses presently operated by Follansbee Metal Warehouses at Rochester, N. Y., and Pittsburgh. The company announced recently that it has concluded negotiations to lease the steel production equipment and the mill section of The Parkersburg Steel Co. plant, Parkersburg, W. Va.

A. W. HERRINGTON, chairman of the board of directors of Marmon-Herrington Co., Inc., Indianapolis, Ind., announces that Bert Dingley is retiring as president of the company, effective July 1. He is to be succeeded by David M. Klausmeyer, who has resigned as plant manager of Chevrolet Commercial Body Division of General Motors Corp.

Manufacturers' Publications

Earth Drills—Economy and speed in drilling holes is claimed for the earth drills described in this bulletin. They are said to be 40 times as fast as the hand method.—*The Buda Co., Harvey, Ill.*

Pipe Tools—A condensed catalog describes a very complete line of pipe tools and equipment.—*Beaver Pipe Tools, Inc., Warren, Ohio.*

Rust Prevention—Extensive research has led to a definite understanding of corrosion phenomena, resulting in the development of protective coatings to meet various conditions under which iron and steel are used. Two handsome booklets tell the story of a coating said to be characterized by high resistance to chemical action, low moisture absorption, high electrical resistance, and great chemical stability.—*Dearborn Chemical Co., 310 So. Michigan Ave., Chicago 4, Ill.*

Thickeners, Clarifiers and Agitators—(16-p. bulletin) Describes tray thickeners, "auto-raise" thickeners, rectangular and circular clarifiers, agitators, hydro classifiers and separators, counter-current classifiers and automatic backwash sand filters. Two tables give data on specific thickening and clarifying operations—*Hardinge Co., Inc., York, Pa.*

Electric Tools—(44-p. catalog) Lists complete line of portable electric tools for construction and maintenance. Included are hammers, drills, screw drivers and nut runners, grinders, sanders, hacksaw and die grinder. Each tool is fully illustrated and described.—*Syntron Co., Homer City, Pa.*

Highways and Byways—(16-p. booklet) Analyzes equipment requirements of impending road construction projects of nation and shows some of initial operations in this program.—*Caterpillar Tractor Co., Peoria 8, Ill.*

Stereograph Drawing Machine—(4-p. folder) Illustrates operation of new device for three-dimension drawing. It shows how expensive models or mock-ups of new designs can be eliminated.—*Pomeroy Stereograph Co., Inc., 318 Empire Bldg., Cleveland, Ohio.*

Clay Products—(8-p. catalog) Gives information on perma-chrome ceramic glazed brick and tile, vitri-granite, unglazed facing tile, buff and gray face

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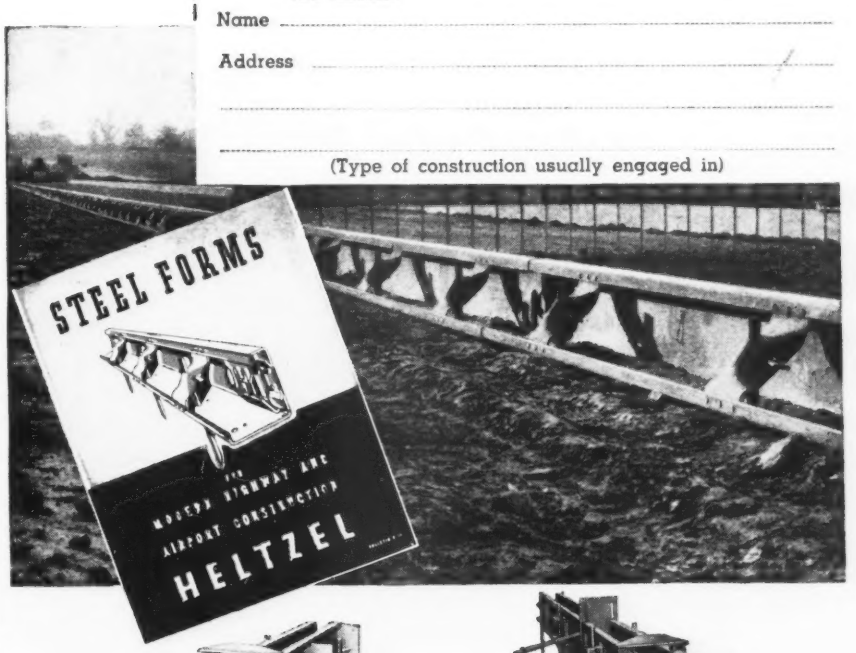

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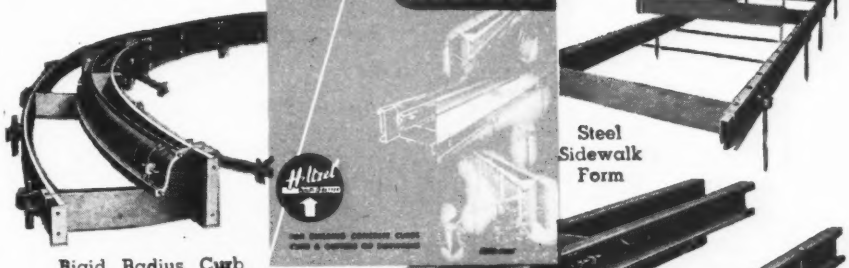

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brick, shale face brick, red face brick, and wyandot face brick.—*Claycraft Co., Columbus 16, Ohio.*

Rotary Positive Blowers—(24-p. bulletin) Cover such applications of blowers as activated sewage disposal plants, supercharging and scavenging of diesel engines, chemical process industries, pneumatic conveying service, tunnel ventilation, mining and smelting, oil refining processes, foundry cupola service, water gas blowing, steel mills and coke oven plants, and vacuum filtration processes. Included are installation illustrations, characteristic curves, cross-sections and exploded views to show operating principle and construction features. Relief valves and other accessories are illustrated. Bulletin also contains page of detailed specifications and table of standard sizes covering gear diameters from 8 to 22 in.—*Roots-Connersville Blower Corp., Connersville, Ind.*

Synchronous Motors—(24-p. booklet) Covers selection and application of synchronous motors and synchronous motor control and contains more than 50 illustrations, diagrams and tables. It contains comprehensive treatment in simple language of operating characteristics, power factor, torques, flywheel effect, speeds, excitation, starting KVA, braking, motor protection, and five principal types of control, with some fundamental considerations of costs.—*Electric Machinery Mfg. Co., Minneapolis, Minn.*

Gypsum Sheathing—(12-p. bulletin) Describes advantages and economy of water-repellent gypsum sheathing and provides specifications for its erection.—*Gypsum Association, 211 W. Wacker Drive, Chicago 6, Ill.*

Waterproofing and Dampproofing—(4-p. folder) Describes industrial asphalt emulsions, cutback asphalt coatings, hydralt protective coatings, asphalt saturated membrane, asphalt mastics and semi-mastics, and spandrel waterproofing cloth. Recommended uses for each product are given. Another 4-p. folder covers heavy-duty asphalt mastic flooring and resilient mastic underlayment.—*Flintkote Co., 30 Rockefeller Plaza, New York 20, N. Y.*

Concrete Aggregate—(92-p. manual) Deals with product's use in building construction, with particular attention to applications for insulating roof fill and structural insulating roof decks. Design data and specifications for use which are outlined are result of laboratory research and field tests made under actual service conditions. Physical values given have been checked by nationally known testing laboratories. Tables give density and compressive strength of various mixes.—*Universal Zonolite Insulation Co., Chicago, Ill.*

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Elections and Activities

Walter W. Berchtold, chief engineer of the Manley division of the American Chain and Cable Co., has been elected president of the Engineering Society of York, Pa. His associates will be Earl J. Oerter, vice president; Milo L. Schaefer, Jr., secretary; Walter H. Shutt, treasurer, with retiring president, Jacob L. Mueller, Ernest E. Cooke and Charles E. Hockenbrocht, as directors. The society has under consideration the purchase or erection of a building for its permanent home.

New officers of the Idaho Society of Engineers are James Reid, Lewiston, president; L. E. Stalker, Idaho Falls, vice-president; Archie Biladeau, Boise, treasurer; W. P. Eaton, Boise, secretary.

C. W. Marshall, president of Dominion Structural Steel Ltd., of Ottawa, Ont., has been re-elected president of the Canadian Institute of Steel Construction. R. C. Manning continues as chief engineer and secretary.

S. C. Ebbert has been elected president of the Engineers' Club of Birmingham, Ala. Other new officers are C. A. Wilmore, vice president; J. R. Hill, secretary-treasurer, and new directors: E. J. Kohn, Charles P. Postelle and C. P. Shook, Jr.

Ralph Brennan, city water works superintendent, Daytona Beach, has been elected president of the Florida Water and Sewerage Works Operators' Association.

The Duke University student chapter of the American Society of Civil Engineers has elected three officers: Hal Becker, Bethlehem, Pa., president; A. T. McCarrick, Philadelphia, Pa., vice-president; and James Murff, Calhoun City, Miss., secretary-treasurer.

New officers of the N. Y. State Association of Municipal Engineers are: President, Arthur Richards, village manager and engineer, Larchmont; vice-president, Charles E. Merritt, consulting engineer, Utica; secretary-treasurer, R. W. Mur-

phy, city engineer, Rye; and directors, C. F. Hunt, village engineer; Endicott; W. F. Kavanaugh, traffic engineer, Syracuse; and D. B. Rasbach, village engineer, Herkimer.

The following nominations have been made for the North Carolina Society of Engineers: President, W. Paul Lyman, Raleigh; vice-president R. P. Reece, Winston-Salem, and T. C. Heyward, Charlotte; directors, first district, H. E. Hicks and Martin Swartz; second district, W. H. Hall and H. W. Kueffner; third district, T. A. Burton, W. A. Bradley, N. J. Comer and W. S. Humbert; fourth district, J. R. Gill and A. H. Vanderhoff. The secretary-treasurer is elected by the board of directors.

M. W. McCulloh has been installed as president of the Engineers Club of Western North Carolina. Other officers Guy H. White, vice president; Harold Hansen, secretary; Warren J. Current, treasurer; and Anthony Lord and G. I. Thurmond, directors.

Charles H. Williams, city engineer and water superintendent of Olympia, Wash., has been elected chairman of the Pacific Northwest section, American Water Works Association. S. J. Benedict, assistant engineer, water department, Portland, Ore., was named vice-chairman and B. C. Gosney, water superintendent of Auburn, Wash., was elected trustee for two years. Fred Merryfield of Corvallis, Ore., continues as secretary-treasurer.

The Concrete Pipe & Products Association, Seattle, Wash., has re-elected Fred M. Kettenring, Seattle, president, with J. R. Sherman, Yakima vice-president and W. S. Wilson, Olympia secretary-treasurer.

Charles B. Wegman has been elected president of the building division of the Portland, Ore., chapter of the Associated General Contractors. Fred H. Reimers is vice-president and J. M. Scudder secretary-treasurer.

Newly elected officers of the Wrecking Contractors Association of New York are: President, Charles Fleschner; vice-president, Harry A. Biesantz; secretary, Manny Pollack; and treasurer, Abraham Greene.

Officers of the Central Illinois section of Sewage Works Operators are: Chairman, George Hall, superintendent, Bloomington-Normal Sanitary District; vice chairman, Dr. W. D. Hatfield, superintendent, Decatur Sanitary District; and secretary, J. L. Arthur, superintendent, Lincoln Sewage Treatment Plant.

Leo N. Newman has been elected presi-

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Failure-proof repairs in your own shop

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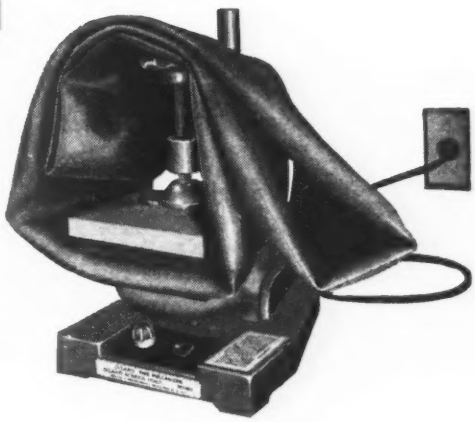
Easy to operate

Handles all size tube injuries and valve stem repairs

For all size tubes



Now—in your own shop, you can turn out professionally perfect vulcanized repairs on truck and tractor tubes—of natural or synthetic rubber—that hold up under toughest operating conditions.

With the new Inland Vulcanizing Unit you can do a fast, thoroughly safe job. Repairs large breaks in 15 to 18 minutes. Handles injuries up to 6" long in one curing, on all size tubes . . . plus all size valve stem repairs.

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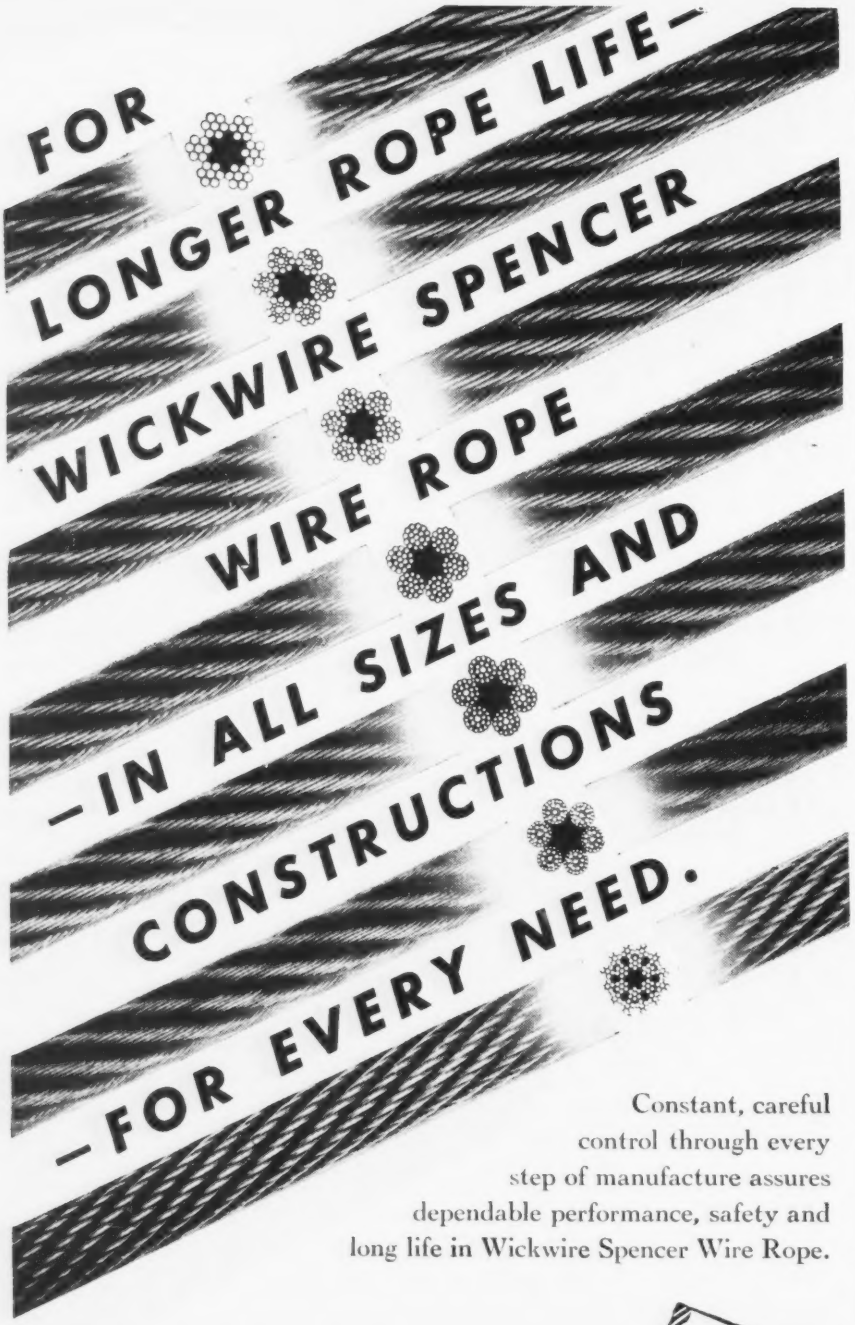

Constant, careful control through every step of manufacture assures dependable performance, safety and long life in Wickwire Spencer Wire Rope.

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Thousands of wire rope users—old hands and new—have found "Know Your Ropes" of inestimable value in lengthening life of wire rope. Contains 78 "right and wrong" illustrations, 41 wire rope life savers, 20 diagrams, tables, graphs and charts.

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dent of Ohio Chapter of the Ohio Society of Sanitary Engineering. Other officers: Horace Wetzel, first vice-president; Ralph W. Oliphant; second vice-president; James Murray, third vice-president and Carl J. Bash, secretary and treasurer.

The Texas Good Roads Association has elected these officers: Tom K. Eplen, Abilene, president; R. J. Potts, Waco, first vice-president; H. B. Zachry, San Antonio, second vice-president; Oscar Burton, Tyler, third vice-president; Charles E. Simons, Austin, executive vice-president; and E. P. Cravens, Austin, secretary and treasurer.

Ward Webber of The Dalles, Ore., is the new president of the Northwest Rivers & Harbors Congress. Vice-presidents are Maurice Andersen, Newport, Ore., and Roy Whitcomb, Willapa Harbor, Wash., Henry Davies of Port Angeles, Wash., was re-elected treasurer, and Alex Stewart of Seattle secretary. Directors are L. L. Goodrich, Longview; Jack Earley, Seattle; Frank Pender, Vancouver, Wash.; J. P. Doyle, Portland; Hans Munn, Everett, Wash.; Eugene Bebbe, Bellingham, Wash.; R. O. Wahlgren Port Angeles, Wash., and A. J. Bogan, Port Townsend, Wash.

The Franklin County Chapter of the Ohio Society of Professional Engineers has chosen the following officers: President, John J. Heier, vice-president, Rolla M. Keatts, and secretary, Eugene W. Davis. Directors elected were: R. M. Edgar, Robt. F. Werner, Myron T. Jones, Neil J. McMillen, Wayne R. Deimel, and J. H. Blodgett.

Mr. Heier is railroad crossing engineer, Bureau of Bridges. Mr. Davis is office engineer, Bureau of Construction of the Ohio Department of Highways. Mr. Keatts is a consulting engineer.

Edgar C. Smith, assistant Fresno County, Calif., engineer, has been elected secretary-teasurer of the County Engineers Association of California. George Macomber of Stanislaus County was named president.

A. W. Noon, Kern County; Roscoe L. Patterson, Tulare County, and Ray W. Sullivan, Mariposa County, were elected to the board of directors of the California Supervisors Association at a recent meeting.

William C. Wright, Cuyahoga Falls, Ohio, has been elected president of the Cuyahoga Watershed Council, to work for purification of the Cuyahoga River and other streams in northeastern Ohio. Other officers elected were Joseph Kahn, Akron, vice president; Fred Schnee, Akron, secretary; and Carl Elwell, Akron, treasurer.

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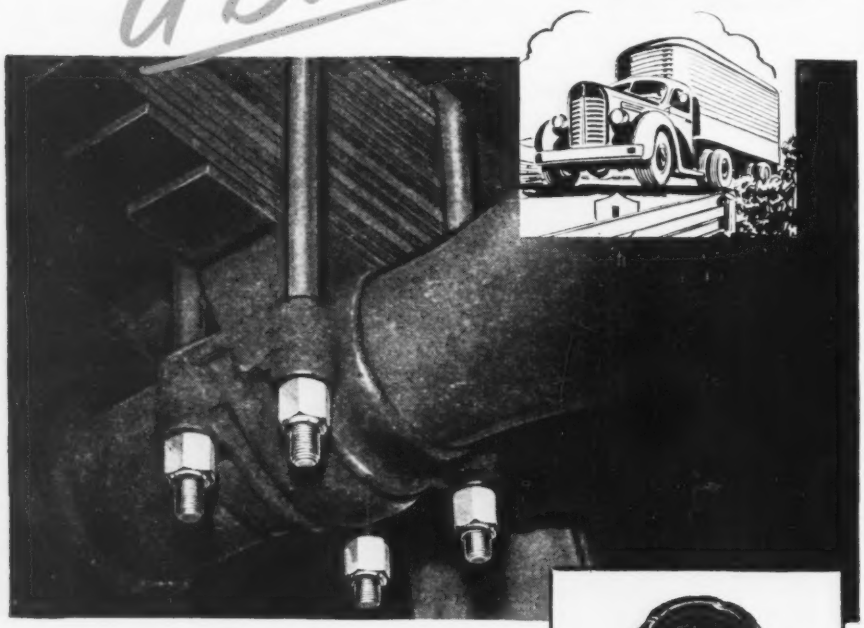

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Loose, or unequally loaded fastenings are the most frequent causes of leaf spring breakage. More than 4,706,000 spring repair jobs have been handled annually in dealer, independent and fleet owner service shops. Many of these could have been avoided.

ESNA has a solution—the NEW U-Bolt Elastic Stop Nut that can be . . . applied to meet the original manufacturer's recommended specifications . . . self-locked in position with the Red Elastic Collar so that no amount of shock or vibration can disturb its setting . . . depended upon to carry a bolt loading of 70,000 psi with its extra-long, extra-strong body.

ESNA U-Bolt Nuts—like all Elastic Stop Nuts—are designed to prevent unnecessary repairs and reduce overhaul time. They are self-locking, easily removed, reusable. They protect permanently against Vibration, Corrosion, Thread Damage, Liquid Seepage, and Costly Maintenance. For further information address: Elastic Stop Nut Corporation of America, Union, New Jersey. Representatives and Agents in principal cities.

The RED ELASTIC COLLAR

—denoting an ESNA product—

. . . is threadless and permanently elastic. Every bolt—*regardless of commercial tolerances*—impresses (does not cut) its full thread contact in the Red Elastic Collar to fully grip the bolt threads. In addition, this threading action properly seats the metal threads—and eliminates all axial play between bolt and nut threads.

All ESNA Elastic Stop Nuts *—regardless of size or type—* lock in position anywhere on a bolt or stud. Vibration, impact or stress reversal cannot disturb prestressed or positioned settings.

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Men and Jobs

George F. Nicholson, captain USNR, consulting engineer, has reopened offices in Los Angeles, Calif., and in Washington, D. C., to specialize in harbor and waterfront engineering and construction and beach preservation. He has been with the Navy's Bureau of Yards and Docks, in charge of construction at Hunters Point on San Francisco Bay.

Col. Wilson G. Saville, former U. S. Army district engineer at Galveston, Tex., and senior partner of the Gravity Meter Exploration Co. at Houston, has been made chairman of the Houston-Harris County Port Commission.

Pennsylvania's Highway Department has announced the following personnel changes:

Appointments—**James R. Graham,** York, bridge designer, at Harrisburg Headquarters; **Harry R. Davidson, Jr.,** New Cumberland, district maintenance engineer, District 1, Franklin; **Mahlon E. Gearhart,** Philipsburg, project engineer, District 2, Clearfield; **Albert F. Boldt,** Reading, project engineer, and **Edmund F. Ferer,** Meadville, district bridge engineer, District 5, Allentown; **Thomas Colantino,** Hollidaysburg, project engineer, District 9, Hollidaysburg; **William L. Scott,** Joffre, project engineer, District 12, Uniontown.

Resignations—**Philip W. Woording,** Allentown, materials engineer, at Harrisburg headquarters; **Edwin P. Koch,** Lehighton, assistant construction engineer, District 5, Allentown.

John G. Butter of Council Bluffs, Iowa, has been promoted to district engineer for the Iowa State Highway Department. He has been with the department since 1919.

Carl Norris, civil engineer, is city manager of Woodward, Okla.

Joseph W. Pahl and **James Gipe,** of Great Falls, Mont., veterans, have joined the engineering firm of Corwin & Co., consulting engineers and architects, of that city.

G. C. Bullock, construction supervisor, of Blaine, Wash., with the Austin Co. for four years, and with the Guy F. Atkinson Co. in the Aleutians, has recuperated from an illness and will become active again in the construction field.

Col. Sidney Hedley Bingham has been appointed general superintendent

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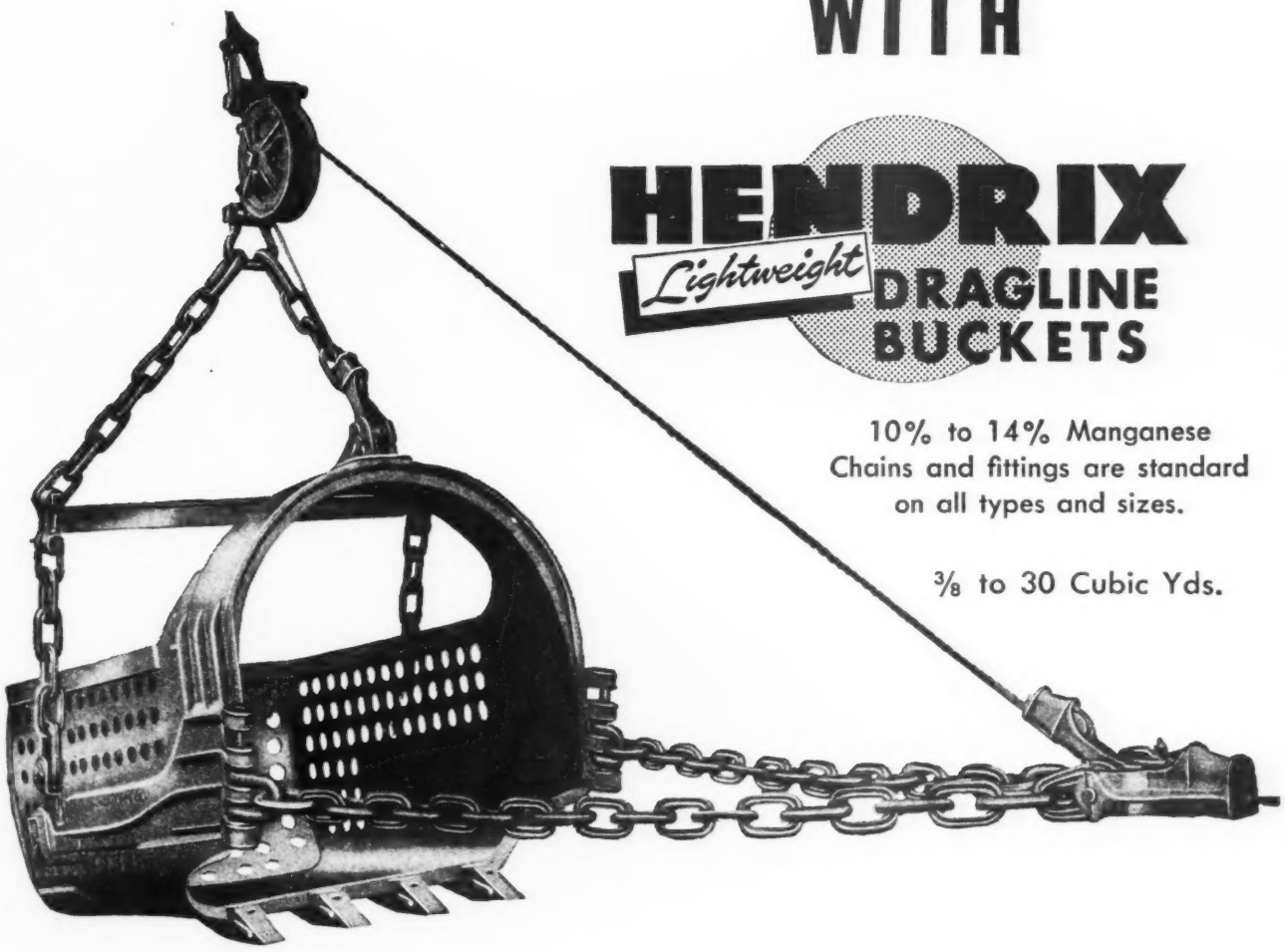
HENDRIX *Lightweight* DRAGLINE BUCKETS



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Chains and fittings are standard
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3/8 to 30 Cubic Yds.

- ★ 20% to 40% lighter than other buckets, type for type.
- ★ All welded construction for greater strength and durability.
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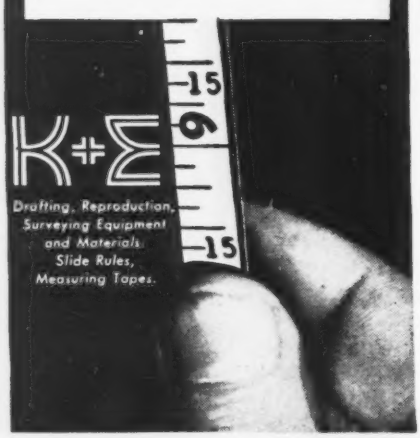

of the N. Y. City Transit System, succeeding the late Philip E. Pfeifer. He joined the Interborough Rapid Transit Co. as a levelman in 1917 and served in the engineering department until he enlisted in the Army, serving for two years. In June 1942 he was commissioned a major and served overseas as assistant to the Director General of Military Railroad Service.

Col. Malcolm Elliott, former Upper Mississippi Valley division engineer has been appointed president of the Metropolitan Plan Association of St. Louis, Mo.

Gordon B. Zimmerman has joined Bechtel Bros.-McCone Co., San Francisco and Los Angeles, Calif., as chief process engineer.

Ricardo Peralta Fernandez, director of the Geographic Institute of Costa Rica, is now conferring with agencies of the U. S. Government regarding American civil engineering methods. He has been head of the San Jose Street Paving Commission and also city engineer. He also headed the boundary commission on the boundary between Panama and Costa Rica. He was Costa Rican minister of public works for two years.

Mr. Fernandez is accompanied by **Federico Braun Gutierrez,** a former director general of highways in Costa Rica and chief field engineer for the power and light company in the construction of Las Ventanas hydro station.

Jorge M. Dengo, civil engineer graduate of the University of Minnesota, 1942, and engineer of secondary roads for the Costa Rican minister of public works, is now studying American road-building methods. Here under the auspices of the Institute of Inter-American Affairs, he reports that in the next few years major developments of the primary and secondary highway systems of his country will take place.

John E. Somerville and **Milo Griggs** have opened an office at 230 N. Walnut Street, Green Bay, Wis., for the practice of architecture and engineering, specializing in industrial and commercial plants and processes. Both have been in this field for a number of years in various connections.

J. S. Allen, of Greenville, Miss., chief engineer for the Mississippi Levee Commission for 24 years, has been retired at his own request, to be succeeded by **W. E. Elam,** formerly assistant engineer. Mr. Allen remains as chief inspector. **W. C. Beanland** and **R. N. Middleton** were re-elected assistant engineers.

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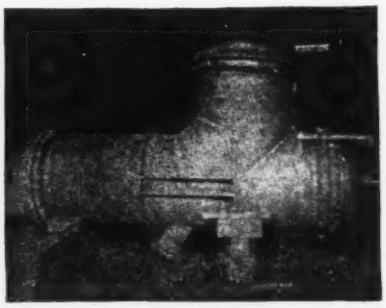

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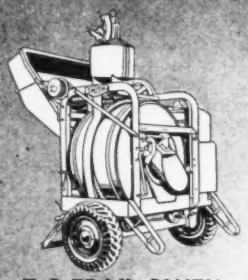
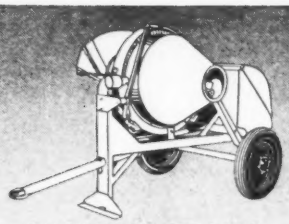
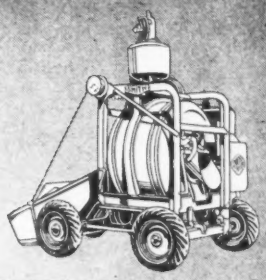


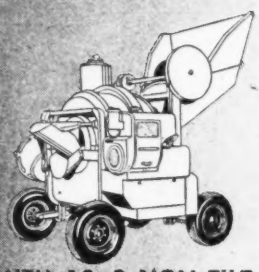
7-S TRAIL-SMITH



SMITH 3½-S TILTER



SMITH 11-S NON-TILT



SMITH 16-S NON-TILT

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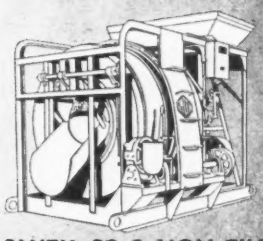
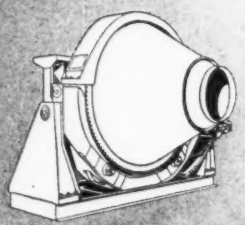
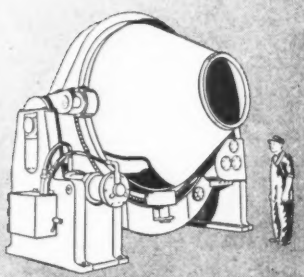


SMITH 28-S NON-TILT



SMITH 28-S TILTER



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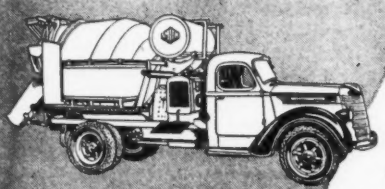

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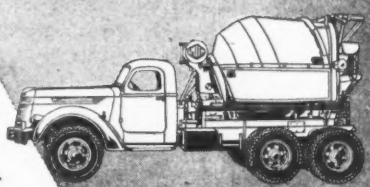

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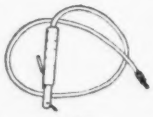

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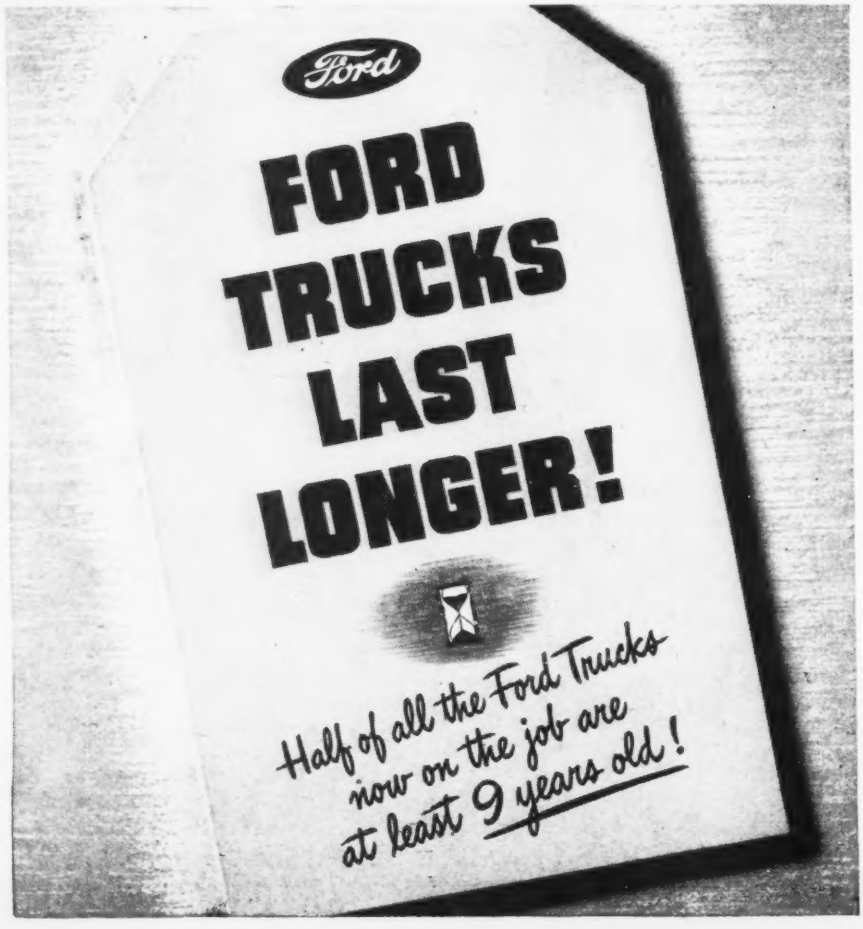

Civilian Activity

L. H. Henderson, formerly a major in the Army Engineers, has been named consulting engineer for the Metropolitan Water District of Southern California. Prior to his period in the service, Henderson was associated with the district in an engineering capacity from 1931, until 1939.

Col. Henry F. Hannis has been appointed district engineer of the U. S. Engineer office at Albuquerque, N. M., succeeding **Lt. Col. R. E. Cole.**

A West Point graduate, Col. Hannis was transferred to Albuquerque from the Manhattan Engineer district, Washington, D. C. During the war he served with the Army Corps of Engineers at Manila, Biak Island, New Guinea, and in the western Pacific. Lt. Col. Cole, who will remain as Col. Hannis' assistant, has been associated with the Albuquerque office since its inception in 1942, and had been district engineer since May, 1943.

Col. Lynn W. Pine, formerly aviation engineer representative at the Command and General Staff School, is now chief of the engineering division, San Francisco District Engineer Office. He has also been acting district engineer, San Francisco District, since April, 1946, during the temporary absence of Col. George Mayo, district engineer.

Lt. Col. George Brice Sumner has received the Legion of Merit medal for outstanding service performed as area engineer at Fort Dix and Picatinny Arsenal, N. J. He is now deputy Philadelphia district engineer, in charge of all Army supervised civil works. He directs all river, harbor and flood control activities. He also supervises dredging of the Delaware and Schuylkill rivers, construction and maintenance work at Absecon, N. J., Inlet and erection of a high level bridge at Chesapeake, Md.

Lt. Col. Sumner was called to active Army duty in August, 1940, as a major. He participated in the pre-war construction program and became assistant constructing quartermaster at Picatinny Arsenal. He joined the Philadelphia district engineer office in November, 1942, as executive officer.

H. F. Cotner, major, Corps of Engineers, has rejoined the U. S. district engineers office, Tulsa, Okla., and is now assigned to the planning section of the real estate branch in the Ohio River division at Columbus, Ohio.

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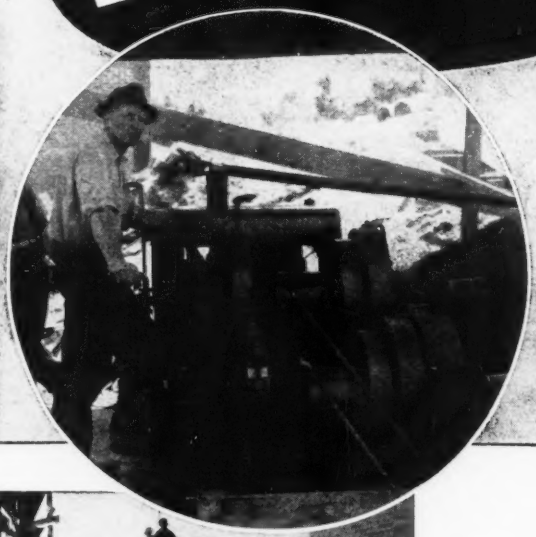

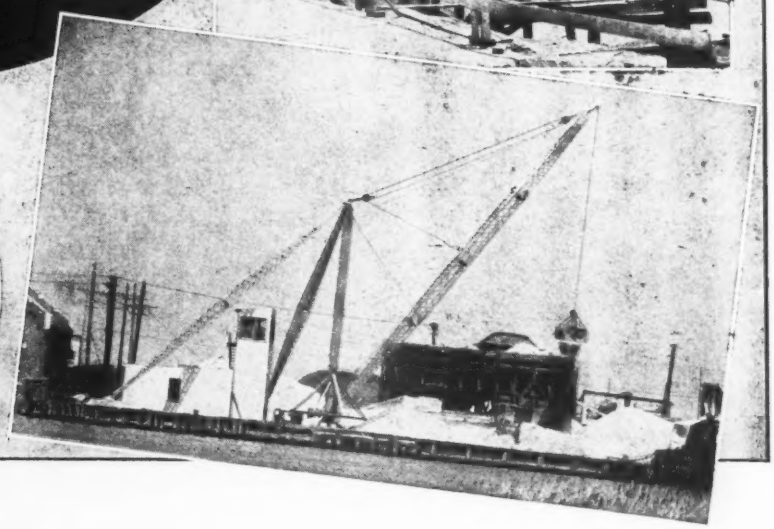

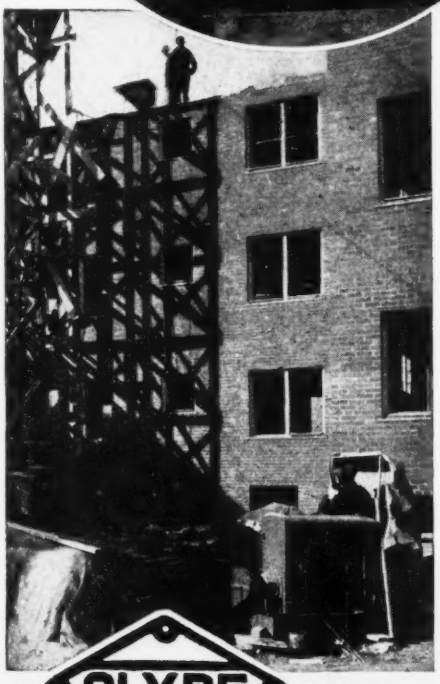

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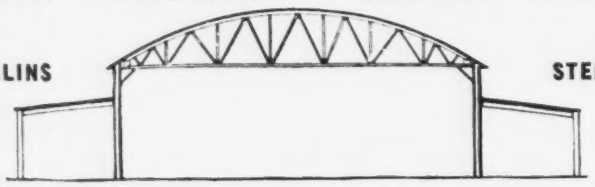

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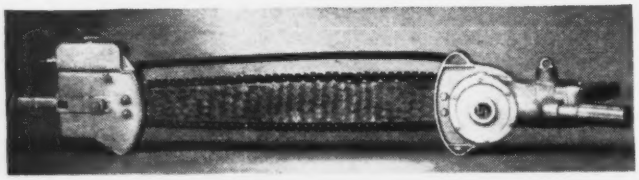

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About District Engineers

Louis H. Strock, Tulsa, Okla., who has been representing the Bureau of Community Facilities of the Federal Works Agency as construction engineer for Oklahoma projects, has been appointed district engineer, and will be responsible for all phases of the bureau's program in Oklahoma.

Col. Frank L. Beadle has been named executive officer of the Portland, Ore., district Army Engineers, succeeding **Col. George J. Zimmerman,** who becomes deputy division engineer under Col. Theron D. Weaver.

A 1922 graduate of the U.S. Military Academy, Beadle was stationed with the Portland district in 1934-35, part of that time being associated with the Bonneville Dam project. He has been on leave after 34 months of overseas service.

In 1942 he went to the South Pacific with Gen. Millard F. Harmon as engineer of Army forces, then went to the Central Pacific theater, serving principally as chief of staff on Tinian.

William H. Newell, lieut. commander, after service with the Seabees in the Pacific, has been assigned to the Charlotte, N. C., office of the War Assets Administration as public health specialist in charge.

Maj. Walter B. Little, Seattle, engineer, has been assigned by Colonel Lang as liaison officer at the Seattle Engineer headquarters for the Alaska District. A 1933 graduate of Stanford University in engineering, he was associated with the California State Highway Department and the Bureau of Reclamation at Boulder Dam before joining the engineering faculty at the University of Washington in 1936.

Six naval veterans have recently returned to their pre-war jobs in the industrial division of The Timken Roller Bearing Co., Canton, Ohio. They are, field engineers **R. G. Harmon** Chicago; **D. G. Gibson,** Cincinnati; **R. L. Williams,** Cleveland; **F. J. Hartshorne,** Milwaukee; and **L. M. Meyer,** Pittsburg; and **S. T. Salvage,** assistant district manager, industrial division, Cleveland.

Ned L. Woods, captain, has returned as assistant Peoria County superintendent of highways, Peoria, Ill. With the Engineer Corps he went overseas in September, 1944, and served in New Guinea, the Philippines, and Japan.

Joseph D. Arthur, Jr., colonel, Corps of Engineers, will retire from the Army soon to became harbor engineer of Baltimore, Md. He has been assistant D. C. engineer commissioner and director of construction.